JOURNAL OF

# SOIL AND WATER CONSERVATION

TO ADVANCE THE ART AND SCIENCE OF

**Volume 16, No. 1**
**January-February**
**1961**

**Soil Conservation in a Dynamic Society**

**Growing Bottomland Hardwoods**

**Fish and Wildlife in Small Watersheds**

**San Dimas Large Lysimeters**

**Striperopping Pacific Northwest Grainlands**

**Domestic Ryegrass as a Cover Crop**

**1961 SCSA Meeting**

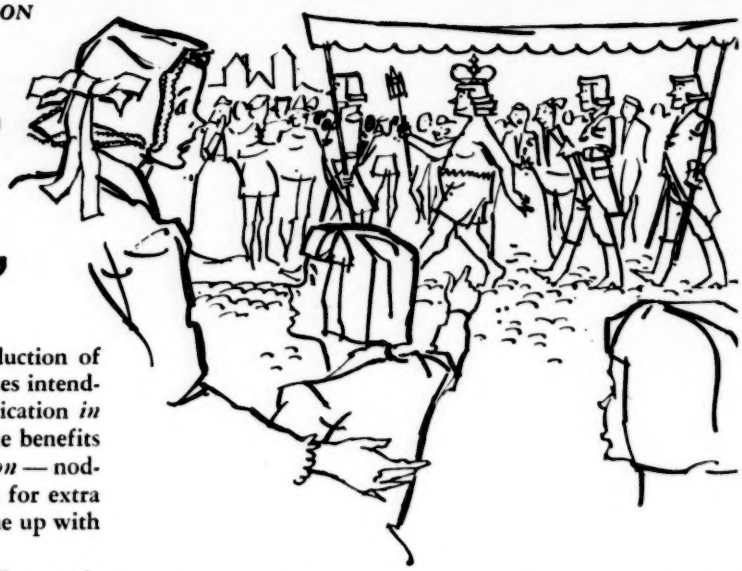
"Land Use in a Changing Agriculture"

PUBLISHED BY THE

SOIL CONSERVATION SOCIETY OF AMERICA

*FIRST OF A SERIES ON LEGUME INOCULATION*

# "but, mother, he has no clothes on!"



Undoubtedly you've watched the hasty introduction of new legume inoculants and inoculation processes intended to make inoculation *easier* or permit application *in advance* by dealer or wholesaler. These sideline benefits are excellent IF *the sole objective of inoculation* — nodulating roots to help legumes use air nitrogen for extra production — is not ignored in the race to come up with "something that will sell."

We are reminded of Andersen's fable of the Emperor's new clothes . . . how a couple of itinerant tailors sold the emperor a suit of cloth so fine only the "pure in heart" could see it. Of course, there was no suit at all! But, being afraid to admit not seeing the suit, the emperor wore it . . . his court praised it and the populace raved about it. All went well until the day of the big parade, led, as usual by the emperor in all his "finery." It was then that the horrible truth came to light as the innocent little child piped up, "But, Mother, *he has no clothes on!*"

There is a parallel to this story in legume inoculants . . . You cannot see inoculant bacteria, nor get them to speak up if still alive.

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TO ADVANCE THE SCIENCE AND ART OF GOOD LAND USE

# JOURNAL OF SOIL AND WATER CONSERVATION®

January-February 1961 Volume 16 Number 1

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COVER: A graceful deer looks inquiringly at the photographer from a spot on winter range in Wyoming.

United States Forest Service Photo

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"TO ADVANCE THE SCIENCE AND ART OF GOOD LAND USE"

838 Fifth Avenue Des Moines 14, Iowa
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Greetings to All Society Members:

As your president for 1961, I am looking forward to the year's work with confidence and enthusiasm. Our tasks will be numerous and challenging -- thereby providing ample opportunity for teamwork and individual membership participation. Theodore Roosevelt once said "Every member owes a part of his time to the upbuilding of the profession to which he belongs". Only by the acceptance of this truth can the Society's objectives and goals be achieved.

The SCSA has achieved an enviable record of accomplishment in its relatively short period of existence. This achievement is the result of hard work by dedicated members, by technical study committees, by chapters and a highly efficient headquarters staff. It is a magnificent example of total membership cooperation. However, with growth comes greater responsibilities and opportunities, too.

Represented in our Society are many professional talents and interests unmatched anywhere in the world. These need to be further refined and synthesized to work on emerging land use and conservation problems and needs everywhere. This is the Society's major task in the present decade, for it has the experience, the leadership, the know-how and the aggressiveness of youth. Plans are well under way to implement this need during the year with the formation of a series of new technical study committees.

Currently, Society programs are at an all time high. Reports show that the membership is strong and offers opportunity for expansion; chapter activities are well organized; committee work is highly productive; the preparation and sale of Society educational materials continues to hold interest; awards and recognition programs are important membership highlights; the Society's headquarters building project is rapidly approaching the construction stage and the Development Fund Board is functioning well. These programs and activities will be up-dated and greatly expanded during 1961.

Your thoughts and views concerning Society programs and activities are also important. Won't you let us know what you think?

Sincerely,

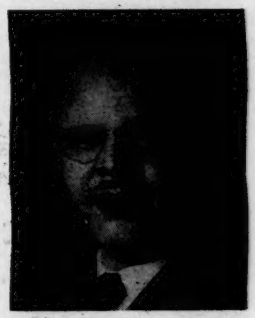
Walter C. Gumbel

Walter C. Gumbel
President

January 1, 1961

# Soil Conservation in a Dynamic Society

MARION CLAWSON



***Soil Conservation is one of the dramatic, significant social movements of the 20th century. Modern soil conservation began roughly 30 years ago. When one thinks of soil conservation and its beginnings, one invariably recalls the late Hugh Hammond Bennett. Like an apostle of old, he preached what he believed, and he made converts. Many, many others have also played important roles in this work, yet many people do not realize that soil conservation is a social movement.***

THE TECHNICAL ACHIEVEMENTS, actual changes in physical land conditions brought about by soil conservation practices, have been very great. But the really outstanding accomplishment of soil conservation has been in ideas, in the change it has brought about in people and in their thinking. The soil conservation movement has led farmers, teachers, bankers, and the general public to look at the land resources in a different way than ever before. Soil conservationists have brought facts and a new way of thinking to these people. In this regard, the soil conservation movement is similar to the drive 100 years earlier for free public schools, or it may be likened to the public health programs of more recent times. In each case, people had first to *think* in new ways before they could *act* in different ways.

The soil conservation movement has accomplished much in the past 30 years. Yet much remains to be done. Where do we stand? How can we move forward more surely and more rapidly? What can we learn from the past? These are the questions that must be asked—and answered—periodically.

### Soil Conservation Is Forward Looking

A basic premise in the whole soil conservation philosophy is that man does *not* live for the present alone. We obviously must eat, be clothed, and have shelter. Life does not end for us today, and life for the whole society is infinite in length, we hope. The soil conservation movement has always emphasized preservation and maintenance of resources for our children, and for their children, and thus for all posterity. We here today are only the temporary custodians of the world's riches; our obligation is to pass them on in good shape, if possible, even better than we found them.

This philosophy is, of course, long familiar to soil conservationists. But it seems highly desirable, even necessary, that we give explicit thought to the future. What problems will soil conservation face during the next 20 or 40 years? Seeing these problems, how can the soil conservation movement best overcome the obstacles it will face, or best adjust to the conditions of the time? A periodic attempt to project the future is an eminently practical device.

No man can know the future. Perhaps it is just as well, for a future robbed of uncertainty would have lost much of its zest. But there are some things we believe we can see coming, and for which we shall want to prepare. Thinking about the future, trying to forecast at least some parts of it, making plans to meet problems and to take advantage of opportunities—these are things all wise men do. They give life greater interest, and they greatly increase our capacity to do those things we most want to do.

### Some Dimensions of the Future

Basic to future soil conservation programs are some pertinent general dimensions of the future.

First of all, total population is increasing. We have 180 million people in the United States today; we may easily have 310 million by 2000. Even larger numbers are readily possible. It is not necessary for our purpose to estimate exactly how many. Barring catastrophic war, we can confidently expect many more people in the future. A much larger proportion of them will live in cities. City people are as dependent on soil and other natural resources as are country people; but, not being as close to the soil, they need more educating of a different kind.

Another major change will be toward higher real personal incomes. Past income changes have been less regu-

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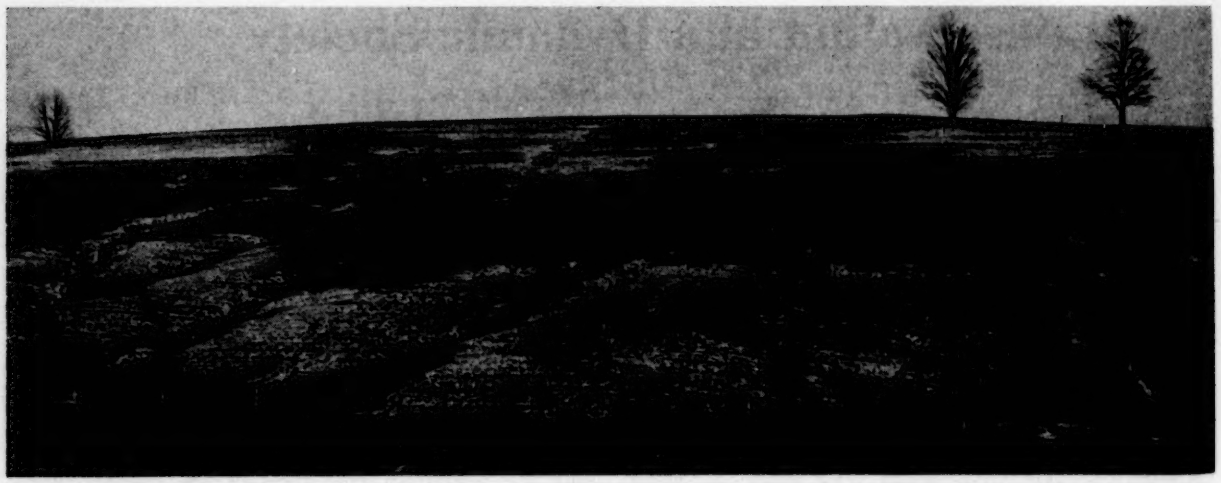
*This article by Marion Clawson is a slightly condensed version of a paper given by the author at the Fifteenth Annual Meeting of the Soil Conservation Society of America on August 29, 1960.*

*Mr. Clawson is a member of the staff of Resources for the Future. A portion of this discussion is based upon a recent book, Land for the Future, by Marion Clawson, R. Burnell Held, and C. H. Stoddard.*



**In spite of truly great progress in applying soil conservation practices to the land, many millions of acres are yet untreated and are still eroding seriously.**

lar and more obscured by price fluctuations than has been past population growth. But there has been a long upward trend in real income per capita. Economists as a group are convinced that further increases in real income are certain; the only difference among them concerns the rate of increase. A likely estimate is that in the United States average per capita income in the year 2000 will be double what it is today—$4,000 then, compared with $2,000 now—and this in terms of the same prices.

A third major social change has been the great increase in leisure. As man has learned to be more productive, he has taken some of his increased efficiency in more goods and services, but some in more leisure. A century ago in the United States, the average work week was 70 hours; now it is less than 40. We have cut the working day from 10 hours or more to 8 or less; and the work week has been cut from 6 or 7 days to 5 or even less. Especially since the war, the paid vacation has become a major feature of American life. It seems highly probable that the work week will be cut further in the future, maybe down to 30 hours by 2000.

Many more people, with much higher average incomes, and more leisure, will almost surely make more demands upon all land and water resources. The impact of these demands will be increased because people will travel more and will move their residences more frequently. In the United States, travel per person annually by all means averaged about 500 miles before the first world war; today, it is about 6,000 miles. By 2000 the average travel per person annually will be about 9,000 miles. People today move more freely, in search of better jobs or more enjoyable living conditions, than they once did. This travel and mobility means that there are no isolated areas any more; any land resource is physically accessible to anyone, although, of course, economic and other considerations are still limiting factors. Soil conservationists must surely think in national, continental, and global terms, not in local ones.

We have all seen the growth in scientific knowledge and the improvement in technology during the past few decades. Agriculture, no less than any other of man's activities, has had its share of scientific and technological revolution. Ours has not been a single dramatic discovery or development, but rather scores of important ones. Better and cheaper fertilizers, new and improved varieties of crops, better farm machinery, better insecticides, improved nutrition of livestock—all these, and many more, have vastly changed agriculture. In the past 50 years, total agricultural output in the United States has doubled from a slightly smaller crop area, with a substantially smaller labor force, and with only small additional amounts of capital. These years, and more particularly the last 20 years, can fairly be called the Agricultural Revolution.

No responsible agriculturalist believes all agricultural progress has been made in the past. On the contrary, our best agricultural scientists agree that we stand on the threshold of still greater, still swifter change. Our children will look back upon our times and consider them important beginnings to the significant changes of their day. We cannot fill in the details, nor the dates; but we can be sure of the direction and general speed. The rate of agricultural progress during the next 50 years will be faster than in the past; technological and farm practice changes will come at an increasing rate. Still better crop varieties, better and cheaper fertilizers, more productive farm machines, better livestock breeding and feeding, increased use of chemicals for many purposes—all these, and perhaps other changes will occur.

## Possible Future Land Use Changes

These general economic and social trends have significance for future land use.

The *area* of land within a state or province or nation is fixed, for all practical purposes. The *productivity* of land can be modified greatly, by application of capital, labor, management, and technical knowledge. Any single use of land can be expanded by transferring land from other uses; but, for all land uses, this is impossible. If one use increases its area, others lose. If total demands on land, for all uses, increase, then they can be met only through more intensive use of land.

These are simple and self-evident relations. Yet they sometimes seem to be overlooked as we consider particular uses of land. If total population grows, average real incomes rise, leisure and travel each increase, and yet, if total land area remains fixed, what does this all add up to for land use?

### *Urban Land Use*

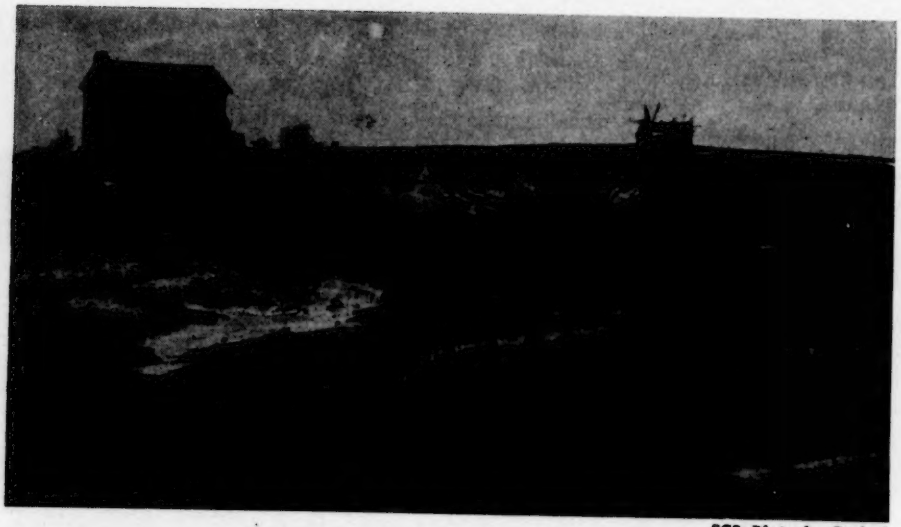
The first change in future land use, the one about which we can perhaps be most certain, will be a very large increase in the area of our cities. If urban population is going to double in the next 40 years, then urban land area must necessarily increase. From about 17 million acres in urban uses in the United States in 1950, the area will increase to 41 million acres in 2000.

The sprawling suburban area is one of the common sights of our day. Each of us knows some tract of land in farms or woods a few short years ago, that now sprouts a few thousand homes and a dozen supermarkets. This covering of fertile soil with street pavement and dwelling structure has disturbed many agricultural people. However, it is necessary to preserve some sense of proportion. Present urban area in the United States is less than 1 percent of total land area; even the prospective increase during the next 40 years will require less than 2 percent of total land area. Not all of the expansion occurs on cropland; some is lower grade grazing or forest land. Moreover, we should recognize that it is the city market which keeps all farm land in production. American agriculture is market-oriented; farmers consume only a small proportion of what they produce. If our cities had not grown these past 50 years, but our agriculture had experienced its technological revolution then the resulting increase in output would have forced farm commodity prices to very low levels.

Nevertheless, the creation of the "asphalt deserts" of our modern cities does create serious land use problems. Runoff is vastly increased from urban areas, thus adding to the severity of flood problems. Cities expand on flood plains. The annual hazard of flood loss today is greater than it was 25 years ago, in spite of spending $3½ billion for flood protection. Cities are demanding water

**During the past 25 years, millions of acres of farmland have been properly treated, curing past erosion scars and establishing a farming system that will endure.**

*SCS Photo by Cole*

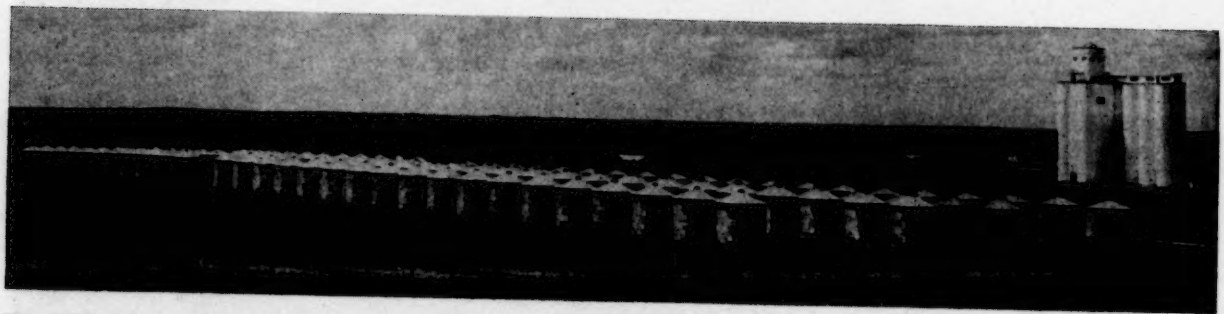


*SCS Photo by Burford*

Some cropland in the United States today is not now needed for crop production, but could best be conserved by growing trees or grass. Many hundreds of thousands of small farms can never provide a decent living to their operators. Combination of such small farms with larger ones seems a necessary land use adjustment.

*SCS Photo by Roberts*

New farm technology offers new ways of conserving soil. It also often means greater output from the same land area. Modern farmers are forced to adopt efficient new practices or else be forced out of production by more efficient competitors.



*USDA Photo*

The application of science and improved technology to agriculture has resulted in burdensome surpluses of some crops. Such surpluses seem probable, if not certain, for the next two decades or longer. Under these conditions the nation can afford to shift highly erosive land out of crops and into more soil-conserving land uses.

for their homes and factories, and to carry off their wastes. Because most people live in cities, and because most of our new capital investment is there, the land use problems of cities deserve very careful study—more than they have had in the past.

### *Land for Recreation*

Another major future land use change will be a great increase in the area of land used for recreation. More people with higher incomes and greater leisure, along with increased travel will create a demand for more outdoor recreation; taken together, their impact may well be staggering. The total demand for outdoor recreation may increase 10 times over by 2000. The greatest impact will be upon relatively distant but superb recreation areas, which today take too much time or cost too much to visit for as many people to enjoy them as will find them within reach in another generation. But there will also be a major increase in demand for all-day outing areas, to which city people can go and return in a single day, usually on the week end.

The most outstanding recreation areas, such as Grand Canyon or Yellowstone, are wonders of Nature; man can find them, and protect them, but he cannot make them. But some very attractive parks can be made, often from land of rather low value for agriculture and forestry. If the increases in demand for outdoor recreation are to be met, the area of land available for outdoor recreation must be increased greatly. A piece of rolling land, perhaps easily erodable and already severely eroded, can be planted to trees to provide a back-country or hinterland. In a small watershed, one of 5 to 25 square miles in total area, a rather low fixed overflow dam can be built on the major stream; this will create an artificial lake with a constant shoreline. A lake of 100 to 1,000 acres may thus be created. In the course of 20 years or less, a highly attractive park can be created, with facilities for swimming, boating, fishing, picnicking, camping, hiking, and other activities. Reasonable convenience to potential users is necessary—perhaps within one hour's driving time.

### *Land Use for Food Production*

Although the number of people is likely to increase greatly in the United States in the next decades, there seems no need to increase the area of cropland. On the contrary, ample supplies of food and fiber may come from an area slightly *smaller* than now used for crops. Agricultural output has increased greatly over the past several decades, from the same area of land. It will increase further in the future. New scientific discoveries and new technology will provide the means whereby this is possible. Each farmer will be driven to adopt new methods which increase his output or lower his costs. This will be true even though the result be lowered prices and reduced income to agriculture as a whole. In agriculture there is a race between the scientists and engineers on the one hand, whose works lead to greatly increased productivity and hence greater supplies of products, and the stork on the other side, who adds to the demand for agricultural products. My bet is on the scientist and engineer. There probably will be a persistent and significantly large agricultural surplus in the United States for many, many years. However, there are so many uncertainties on both the supply and the demand sides of the agricultural equation that no one can really be sure of the balance between output and consumption.

If we are going to greatly increase agricultural production from the present area or even fewer acres of crop land, then it is obvious each acre will work harder in the future than at present. The intensity of farm operations will increase, especially on our better land. As one looks back over the last 50 years, it is clear that this is exactly what has happened in the past. We have learned from trial and error which are our best lands, and increasingly directed our labor, our capital, and our management toward them. This surely points to the need of conserving and protecting such lands against erosion and against other losses of productivity. We cannot neglect our poorer farm lands, the marginal ones where slopes are steep, soils are shallow and eroded, and productive potential is low. Their protection is important, partly because deterioration often results in damage to more productive valley areas. But we must proportion our effort and our money, finding ways of protecting less productive areas at lowest cost, so that we may be able to do a really superior job on the most productive lands.

### *Forest and Grazing Land Use*

For the large areas of forest and grazing land, the situation is roughly similar to that for crop land. We cannot increase greatly the area of either land use; in fact, each is likely to shrink slightly in total area as other uses take over some of the land presently in forest and range. On the other hand, demand for lumber, pulp, and other forest products will rise considerably; so will demand for beef, lamb, and wool that may be raised on grazing land. The only solution is more intensive production on each type of land. Fortunately, production of either trees or grass on a sustained yield basis contributes powerfully to soil conservation. Happily, the day of "cut out and get out" seems largely past. Both private forest owners and private owners of grazing land seek in increasing numbers to practice sustained, intensive land management. The unrealized productive potential of our forests is very great. Large areas need replanting, other areas need heavier stocking, and in many areas thinning, stand improvement, and other

practices which lead to greater output per acre could be used. The output of grazing lands can be increased also.

*Other Land Uses*

Two specific forms of land use require further mention, use of land for transportation, and for reservoirs. Though each is small relative to the national land area, yet each tends to be overriding in competition with other uses. Moreover, the site factor is particularly important; roads must be located according to sound engineering principles, and reservoirs must lie upstream from the best dam sites. Neither roads nor reservoirs can be located just anywhere. The area in highway rights-of-way will surely increase as more superhighways are built. But often overlooked are the many rural dirt roads abandoned, as farms, ranches, and forest lands are formed into larger holdings and as remote residences are abandoned. The total area used for all forms of transportation in 1950 was 25 million acres; I estimate the figure will be 30 million acres by 2000. The area in reservoirs is likely to increase from 10 million to 20 million acres in the same period. A comparatively large area for reservoirs will be required in order to provide storage so as to maintain low river flows at a large enough volume to carry off urban and industrial wastes.

## Specific Problems for Soil Conservationists

These general trends are significant in terms of more specific problems affecting soil conservation.

First of all, in the United States we face tremendous changes in the number and size of farms. In 1920, there were 6½ million farms; now there are but 4½ million. This is only the beginning of the adjustment process. By the year 2,000, it is doubtful if we shall have as many as 1 million farms. There has been a great increase in part-time farming since the war, but this may prove to be a one generation phenomenon. That is, faced with a farm too small to occupy his time, and/or too small to provide a decent income, and lacking capital to buy more land, many a farmer who could find an outside job took it. In the future it will take as much technical knowledge and skill, and as much machinery, to farm half a farm as to farm a whole one—and the financial rewards will be far less than half as great. Outside jobs will be too demanding to enable many men to run a farm also. When the outside job seems permanent, many a man will quit farming his land, though he may yet live on it—or at least his son will quit farming. Commercial farms will continue to grow bigger, although essentially family-operated.

Major changes in average farm size will accompany this great decrease in farm numbers. Consolidation of farms has been under way for a long time in some regions, but has been much more noticeable on a national scale since the war. Its pace will surely be speeded up in the future. Farmers in the United States are getting relatively old; in many areas, an unusually high proportion of them are past 60 years. Many young men have left poorer farm areas. When the present farmers die, no young man will be interested to take over a farm which is substandard in economic opportunity. Such units will be combined with other nearby farms. This process is by no means limited to our poorer farming areas. Even our best Corn Belt commercial farm areas have far more operating units today than they will have a generation hence. Iowa may have only half as many farms by the year 2000 as it has now.

These radical changes in farm size will surely force some major changes in soil conservation plans. The land on one farm with 400 or more acres of crop land plus associated woods and pastures will surely not be operated in the same way as when it was in 6 farms of 65 acres cropland each. Crop rotations, land use, and other aspects of farm operation will be readjusted in a major way. The old farm conservation plans will need to be revised. And what will happen to soil conservation districts, if farm numbers decline to one-fourth present numbers?

The technical revolution in agriculture will surely continue for many years. Techniques may be developed that will be directly useful in soil conservation activities. But in other cases new techniques may impose soil conservation problems. New fertilizing methods and other techniques may make continuous corn on the best soils highly profitable, for instance. This may well result in more abundant corn crops and lower corn prices, thus putting severe economic pressure on areas not capable of such adjustment.

If the rate of development and adoption of new farm technology outruns the growth in demand for farm products, as seems probable, then the existence of agricultural surpluses will be part of the economic and political environment for soil conservation. Some persons, viewing agricultural surpluses, jump to the conclusion that soil conservation programs are no longer necessary. This is a wholly false and unwarranted conclusion, in my judgment. But we certainly cannot ignore such surpluses—the annual cost of storing wheat surpluses alone is far greater than the amounts spent annually for soil conservation. At the very best, we can say that there is *not* heavy pressure of food demand upon land productive capacity. It will *not* be necessary to keep every acre in production at its highest possible level of intensity.

The soil conservation movement has always had undertones of food scarcity. Dire warnings about the future of a nation which eroded its topsoil have been standard arguments for soil conservation. There is still good reason to be concerned about the future, still good reason to avoid needless destruction of soil and other resources.

But the scarcity argument has already worn thin after nearly a generation of burdensome argricultural surpluses; it will be positively threadbare in another two decades. The boy who continually called "Wolf! Wolf!" when there was no wolf was unable to attract help when the wolf really came. It seems to me some serious restatement of soil conservation philosophy, and maybe even some re-thinking of it, is urgently needed.

Another factor we will face in the United States is a continuously tight federal budget, one from which it will be difficult to get adequate funds for soil conservation programs. There is great political resistance to increasing federal taxes; neither political party will seek increased taxes unless there is some dramatic national emergency to make them publicly acceptable. Total demands on the federal budget will be very great. Unhappily, there is little reason to expect national defense and related expenditures to decline, even if the Cold War should thaw somewhat. Urban renewal, federal aid to education, and other programs primarily aimed at our cities are likely to require significantly larger future expenditures by the federal government. My judgment is that all natural resources programs will face a difficult time if an attempt is made to increase expenditures for them, and there may even be difficulty in maintaining present expenditures.

Today we sometimes lose sight of the fact that soil conservation programs as we know them in the United States today are children of the Great Depression of the early 1930's. It was the emergency public works and employment programs of those days which provided the necessary funds. The severe drouths of that period and the resulting dust storms provided the dramatization of the problem which enlisted public support. A soil conservation program would almost surely have developed had neither depression nor drouth struck. But it would have been much slower and more timid, and administered by some existing agricultural agency rather than by a new one dedicated only to this task.

Soil conservation will never again experience such dramatic times as the 1930's. Soil conservation has become accepted, "respectable" if you will. That is excellent in many ways; but it also means that new enthusiasm and new steam will be hard to generate. Possibly because it is accepted, soil conservation will increasingly be under pressure to confine its role and its magnitude of operations to that now existing.

This brings me to my concluding point: Soil conservation in the future must be more economically-minded and economically oriented. To the pioneers in soil conservation there was only one goal: save precious topsoil! They assumed either that necessary soil conservation programs would be profitable to farmers or that the nation simply had to support whatever was necessary. Most of those early soil conservation pioneers never faced economic calculations unless they were forced to do so. They were evangelists, salesmen, dynamic leaders. That approach was essential in their day; the nation and each of us is definitely better off because of their efforts. The new *social* movement of soil conservation was born and grew in that atmosphere.

We have outgrown that period of early beginnings. Soil conservation today must sell itself to the farmer in terms of its effect upon his income and upon the value of his assets. It must increasingly sell itself to the nation, including the large urban masses, on the same basis. Both farmers and the public will increasingly critically examine methods, costs, and results of soil conservation programs. The public in particular will ask if major changes in land use may not be a cheaper way of preventing soil loss than are direct practices applied on cropland. The continuing agricultural surpluses will add a sharper tone to their questions. The claimed advantages of flood control and other water management programs will surely come under increasingly sharper scrutiny.

Unless soil conservation can answer these questions more satisfactorily than they have in the past, further progress in soil conservation will be slow and limited. The abler and more progressive farmers, who can best work out for themselves what is profitable and what is not, have generally adopted that degree of soil conservation which they thought was profitable for them now. But a distressingly large percentage of all farmers have adopted comparatively little soil conservation. Economic considerations, of cost and income, and institutional considerations such as tenure have often deterred them. We must confess that in all too many cases soil conservation is still sold on an evangelistic basis.

Soil conservationists should not fear challenges on economic grounds. If their programs are really sound—as in most cases they are—the economic soundness can be proven through the most hard-headed calculations of costs and returns. Soil conservationists must be prepared to supply accurate data and to aid in calculations that will satisfy the skeptical. If such programs are not sound because they are too costly in terms of results, then soil conservationists should be the first to seek other and more effective means. Those who ask for proof of economic soundness may be critical and properly so; it should not be assumed that they are hostile.

The soil conservation movement has long since proven that it is viable and vigorous. I have no doubt it will continue to be so. Future problems in soil conservation present a challenge; but life consists of meeting challenges successfully. It may be necessary to modify some old methods and to devise some new ones. But there is no basic reason why the problems of the future should prove more difficult than were the problems of the past.

# Growing Bottomland Hardwoods

LEON S. MINCKLER

***How to make the best use of overflow bottomland sites has always been a problem. The soils on those sites are usually fertile but seasonal flooding, poor drainage, or both, often make farming uncertain and expensive. Even so, the present trend is toward clearing more bottomland for agriculture. It would behoove owners of such land to consider growing timber on it so as to take advantage of the remarkable tree growth that is possible on such sites.***

BOTTOMLANDS usually have deep, complex soils ranging from sand to clay. However, all bottomlands have one thing in common. They not only receive the normal rainfall of the region but also many inches of runoff water from the uplands. This ample water supply combined with the usually deep soils provides an excellent site for tree growth, one of the best in the Nation. On areas unprotected by a levee, a farm crop is a gamble (although the odds may be known). Also, many areas both inside and outside of levees have high water tables and heavy clay soils that do not permit cultivation, at least not early enough in the spring to start a crop.

Expert advice may be needed when a landowner is not certain whether to clear a bottomland area or devote it to wood production. Help can be obtained from the Soil Conservation Districts, Soil Conservation Service, county extension agents, farm foresters, extension foresters, and universities having agricultural colleges or forestry departments. If a decision is made to grow timber, assistance and advice can be obtained from farm foresters and extension foresters at no cost, or from consulting foresters for a fee. Some of the large wood-using industries also furnish technical advice when the wood products from a tract are sold to their plants.

## How To Make Bottomland Forest Productive

There are five basic steps bottomland forest owners must take to make their forests productive.

**1.** Protect the Forest. Forests must be protected from fire and grazing. Fire in the woods and grazing by domestic stock or excessive deer browsing are not compatible with wood production. Protection from diseases and insects is also required, but in most hardwood forests they can be adequately controlled by keeping the forest in a vigorous growing condition.

Most fires are man-caused and can be reduced by stopping the unauthorized use of the tract by outsiders. If a bottomland forest is used by hunters, post the area, require permission to hunt, and take this opportunity to caution users about preventing fires. Firebreaks freshly plowed during times of high fire danger are also useful for preventing fires, but the opportunity to use firebreaks varies with individual tracts.

Grazing by cattle can only be eliminated by proper fencing. Excessive deer browsing can be prevented by regulating the size of the deer herd through hunting.

**2.** Appraise the Woodland. Answers are needed to the following questions:

- What tree species are best suited to the bottomland sites? What growth rates and yields can be expected? Most owners will probably need to consult a forester to obtain this information. If there is no one to consult, published information can be obtained from state experiment stations, the universities, State departments of forestry, or the U. S. Forest Service.
- What is the condition of the timber at present? "Condition" includes the species composition, tree size distribution, number of trees per acre, and quality and vigor of the trees. Many owners probably will need help to make this appraisal.
- What is the flooding situation; i.e., how often does the land flood and what is the severity and duration of the floods? Many bottomland trees can withstand repeated seasonal flooding. It is important to know which ones to favor in future management.

When this appraisal is completed and analyzed, often with the assistance of a competent advisor, one will be well prepared to take the next step in forest mangement.

**3.** Study Marketing and Economics. A vital part of good business is to learn which timber products can be sold and at what price. Determine whether there is an operable cut; i.e., is there enough merchantable timber to interest a timber operator or make a logging job worthwhile? Compare prices of trees sold on the stump with prices for logs and decide how to market the forest products—as stumpage or as logs or other products—that will deliver to a road or directly to the wood-using plant.

**4.** Mark Timber for Harvesting. It is important to know which trees should be cut, which ones should be left to grow, and which trees should be killed because they are worthless and occupy space needed for desirable trees. What products can be sold and how and when the cutting should be done also must be decided. Before the

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trees are cut or killed one should find out about methods and costs of killing worthless trees and the possibility of obtaining Agricultural Conservation Program help for doing this stand-improvement work.

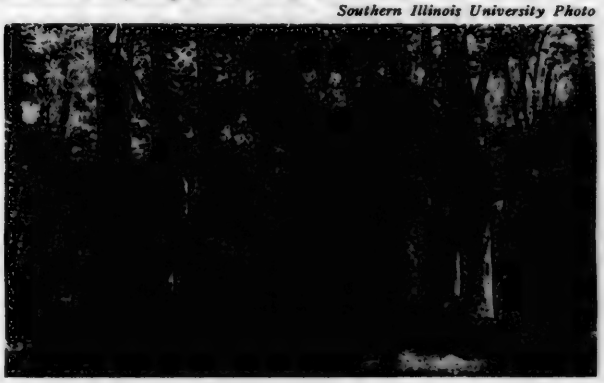
The marking job is the "payoff" or the final use made of the information about bottomland forest and about logging and marketing conditions. Because the future wood production of the forest depends to a large extent on what trees are cut or killed in this initial treatment, it is important to do a careful marking job and appraise every tree. It is preferable to have a forester help on this phase, too; but if no professional help is available, the following broad guides will be helpful:

- Mark for harvest the mature and low-quality merchantable trees, and the high-risk merchantable trees (those not expected to live or grow well until the next cut). These trees will provide a cash income.
- Eliminate the cull trees. These are unmerchantable trees that do not have any value except for fuelwood or will have no value in the future for other wood products. If these trees are not cut for fuelwood, they should be killed.
- Provide space for successful reproduction. Seedlings require light and soil moisture to survive and grow. The openings made in the forest canopy by cutting and killing trees are absolutely essential for the successful reproduction. This is particularly important in bottomland forest types because most of the better species require one-third to one-half full sunlight to survive and grow well.

When the above has been accomplished, the stand has been "rehabilitated." Removal of the harvest and cull trees has reduced competition among trees for light and moisture and the trees left will respond by growing faster. Space is available for the establishment of desirable seedlings. Seedlings will soon grow into saplings, saplings will soon reach pole size, and poles will attain sawtimber size in a few years.

**Figure 1. A stand of cottonwood on a formerly cultivated bottomland field. This stand is similar to the one described in the text but younger and has less volume.**

*Southern Illinois University Photo*



**5.** Sustained Yield. After the forest has been rehabilitated and is in thrifty condition, the subsequent treatment will depend on which system of management is appropriate for the stand. This should be prescribed by a professional forester. The system used must fit the conditions present or anticipated. If the proper system is used, there will be: (a) maximum production of high-quality products, (b) continuous adequate establishment and growth of desirable trees in places where trees are harvested, (c) sustained yield of forest products, and (d) soil stability and a good wildlife habitat.

## Examples of Bottomland Forestry Potential

To illustrate the remarkable growth that trees make on bottomland sites, four stands of different species that were found in the bottomlands of southern Illinois will be described. The first three stands had not been managed. With proper management, yields could have been increased.

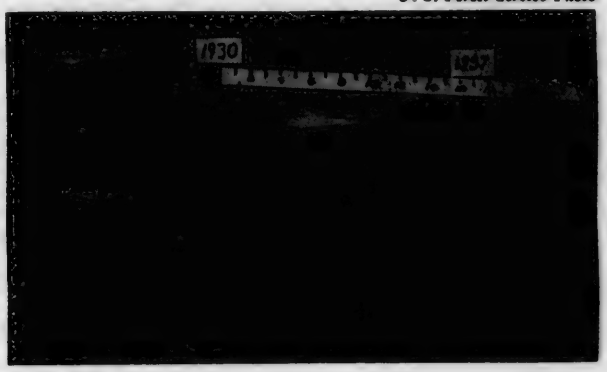
*Case* 1. A well-stocked cottonwood stand (figure 1).

At 25 years of age this stand had 11 trees per acre 17 inches or larger in diameter. Just 4 years later there were an additional 21 trees per acre that had grown to a diameter of 17 inches or more. These 32 trees had a volume of more than 10,000 board feet. The total volume of sawtimber trees 11 inches and larger was 21,000 board feet. The growth rate indicated that in another 5 years the sawtimber volume would be about 30,000 board feet. This would be a growth rate of 800 to 1,000 board feet per acre per year for the whole life of the stand which is not unusual for well-stocked cottonwood stands on good sites (figure 2).

Cottonwood logs delivered to the mill are worth $50 to $60 per thousand board feet. In the above stand the value of the cottonwood logs at age 34 would be $1,500 to $1,800 per acre. The value of these cottonwood trees on the stump would be $750 to $900 per acre.

**Figure 2. This cottonwood tree grew to 36 inches in diameter in the 27 years before it was cut. This is not unusual for well-spaced cottonwood trees on good bottomland sites. Such a tree would have three to four 16-foot logs and a volume of about 1,500 board feet.**

*U. S. Forest Service Photo*



*U. S. Forest Service Photo*

**Figure 3. An excellent stand of pure sweetgum on a formerly cultivated bottomland field subject to periodic flooding. This stand is only 43 years old and contains 14,000 board feet of sawtimber plus 25 cords of pulpwood per acre.**

*Case 2.* A young well-stocked sweetgum stand (figure 3).

This stand at 40 years of age had 14,000 board feet of sawtimber plus about 25 cords of pulpwood per acre. Three years later the sawtimber volume was 18,000 board feet. In another 5 years the sawtimber volume of trees 11 inches in diameter and larger will be at least 25,000 board feet per acre and about 5,000 board feet of this will be large enough to cut for high-quality logs.

Average quality sweetgum sawlogs are worth $25 per thousand board feet and large veneer logs at least $50 per thousand.

*Case 3.* An immature stand of green ash (figure 4).

This 32-year-old stand had 148 trees per acre 8 inches or larger in diameter. After 3 years the number of trees in this size class had increased from 148 to 171 and the board foot volume of trees 11 inches and larger had doubled. After 5 more years this stand (at age 40) will have at least 5,000 board feet per acre and many of the ash trees will be large enough to cut for handle bolts.

*U. S. Forest Service Photo*

**Figure 4. An immature stand of pure green ash 32 years old on a formerly cultivated bottomland field subject to flooding. These trees have high potential value.**

*Southern Illinois [illegible] Photo*

**Figure 5. A heavily stocked but unmanaged stand of mixed bottomland hardwoods on land subject to frequent overflow. This stand has many culls and low quality trees that should be cut or killed.**

*Case 4.* Mixed bottomland hardwoods of different ages on a poorly drained site (figure 5).

These stands of mixed species averaged 11,000 board feet of sawtimber per acre plus a large number of cull trees worthless except for cordwood. About 6,000 board feet of sawtimber per acre was cut and all the cull trees were killed (there were no pulpwood markets). The best and most vigorous trees were left to grow and during the next 3 years these stands grew an average of 1,800 board feet per acre. The treatment resulted in a good harvest of timber, got rid of the culls, promoted fast growth of the relatively good trees left, and resulted in good reproduction of tree seedlings.

Mixed bottomland hardwood stands, if properly managed, will produce a cut of 3,000 to 4,000 board feet per acre of high-quality sawlogs plus 3 or 4 cords of pulpwood every 5 years. With stumpage averaging $30 to $40 per thousand board feet, a good income from this land is possible.

From the above examples it is apparent that trees grow rapidly on the bottomlands. Furthermore, where a stand of trees already exists, there is no cost for establishing the stand—nature did this without cost. Unlike agricultural crops, no intensive soil preparation, fertilizing, or cultivation is needed. Oftentimes all that is needed is management and the bottomland forest owner is in a "good business." ◻

# The San Dimas Large Lysimeters

JAMES H. PATRIC

ONE OF THE MAJOR PROBLEMS in watershed management is to learn the patterns of soil moisture use by plants on the watersheds. Once identified, plants requiring little water may be favored by eliminating extravagant water users. Such identification is difficult within the extreme variability found among plant associations, climates, and soils in nature. But a high degree of control over environmental factors may be achieved in lysimeters, thereby isolating vegetation as the only important variable influencing evaporative losses of soil moisture. Despite such shortcomings as root confinement and a soil-air interface (2), lysimeters are presently the most satisfactory instruments available for comparing water use by plants.[1]

The San Dimas Experimental Forest[2] was chosen as the site for a lysimeter establishment in which might be compared the water economies of native plants. The Forest lies about 35 miles northeast of Los Angeles in the brush-covered front range of the San Gabriel Mountains. Here the Forest Service maintains a 17,000-acre field laboratory to study local watersheds and their management. Lysimeters form an integral part of the watershed management research program (6).

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## Lysimeters Described

Construction of the San Dimas lysimeters might never have been undertaken had not a large labor supply been available from emergency work programs in the 1930's. After intensive planning, work was started in 1935. Almost 3 years were required for crews of CCC and WPA workers to complete this largest installation of its kind.

The lysimeters permit comparisons of water use by plants under conditions of minimum environmental variation. They are contained within a 2-acre rodent- and deer-proof enclosure. A climatic station within the area is equipped to measure weather changes known to influence evaporation. Each plant species under test is surrounded by a buffer-zone of like cover so that the lysimeters, in effect, are sampling areas of uniform vegetation (figure 1).

[1] Kohnke, et al. (12) have reviewed the literature to 1940 regarding lysimeters. The excellent bibliography in Harold and Dreibelbis (8) surveys the more modern work reported in this field.

[2] The San Dimas Experimental Forest is a field unit of the Pacific Southwest Forest and Range Experiment Station, Forest Service, U. S. Department of Agriculture, maintained in cooperation with the State of California, Department of Natural Resources, Division of Forestry.

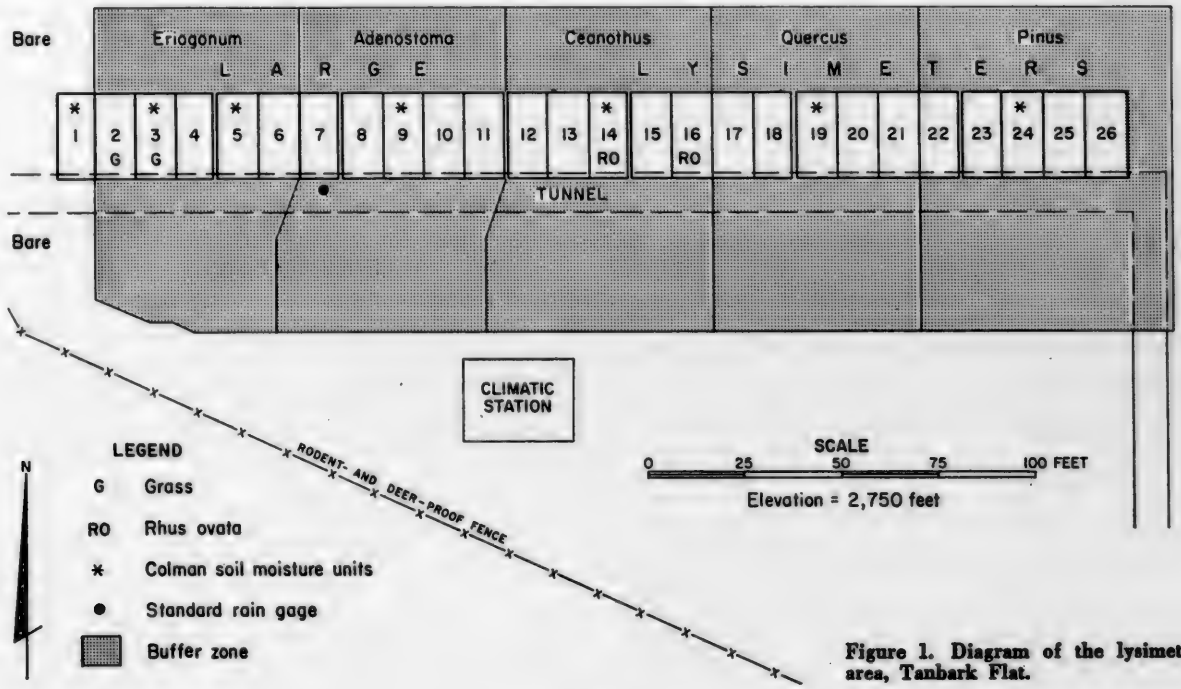


**Figure 1. Diagram of the lysimeter area, Tanbark Flat.**

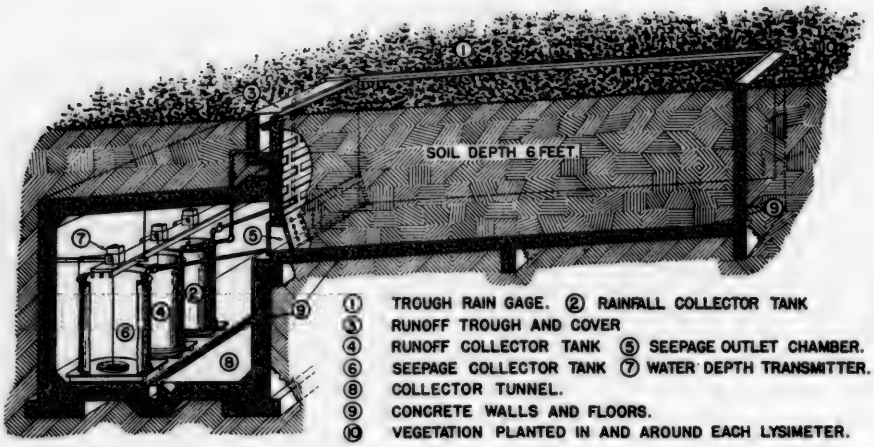
SOIL DEPTH 6 FEET
① TROUGH RAIN GAGE. ② RAINFALL COLLECTOR TANK
③ RUNOFF TROUGH AND COVER
④ RUNOFF COLLECTOR TANK ⑤ SEEPAGE OUTLET CHAMBER.
⑥ SEEPAGE COLLECTOR TANK ⑦ WATER DEPTH TRANSMITTER.
⑧ COLLECTOR TUNNEL.
⑨ CONCRETE WALLS AND FLOORS.
⑩ VEGETATION PLANTED IN AND AROUND EACH LYSIMETER.

**Figure 2. Diagram of a single large lysimeter. This lysimeter has a surface area of 5 milacres (10½ x 21 feet).**

Twenty-six contiguous concrete boxes, each 10.5 feet wide, 20.8 feet long, and 6.0 feet deep, form the large or master group of the San Dimas lysimeters. Each contains about 64 tons of soil. All concrete-soil contacts have been sealed with a waterproof phenolic resin paint. Each lysimeter has a surface and bottom slope of 5 percent on its long axis, enough to insure adequate drainage without introducing slope as a factor in the studies. Runoff from the concrete partitions is carried away by troughs which thus eliminate all sources of soil moisture other than precipitation. Runoff from the surface of each lysimeter is collected in a trough beneath and extending across the lower end of the soil surface. Seepage water drains along the sloping concrete bottom through a perforated plate lying across the edge of the soil mass (figure 2).

Several kinds of data are required to compare water use by plants in this installation. Runoff and seepage are measured separately for each lysimeter in collector tanks located in a tunnel adjacent to the lysimeter line (figure 3). Water stage transmitters (5) mounted on the collector tanks are connected to strip charts which record rates of runoff and seepage. This automatic recording is important, for rate measurements are valuable in studies involving soil moisture movement. The metal troughs covering lysimeter walls (figure 2, item 1) were designed to catch throughfall; i.e., rain penetrating the vegetative canopy. Given the rainfall, measurements of throughfall and stemflow permit calculation of interception loss by vegetation. However, these measurements are quite intricate and have not been undertaken; instead, interception is included in calculations of evapotranspiration.

**Figure 3. The lysimeter tunnel showing runoff and seepage collection tanks.**

*Photo by Blythe Mendenhall, Pasadena Star News*

## The Soil

The lysimeters were filled in 1937 with local reddish sandy clay loam, which had developed residually at the site from highly fractured, deeply weathered dioritic rock of the San Gabriel formation. The soil resembles the Fallbrook series. Profile development was weak. Clay content of the original soil increased slightly to a depth of 12 inches and then decreased progressively with depth, a condition closely reflected in the moisture equivalent of soils from these levels.

Every effort was made to remove textural variation from the soil used to fill the lysimeters, an essential step in providing a plant environment of minimal variation. Some 2,800 cubic yards were removed by hand from the lysimeter excavation in a manner calculated to obliterate all traces of profile development. A second, more thorough mixture was obtained by putting soil through a modified concrete mixer which pulverized clods and screened out all rocks and roots over ¾ inch in diameter. Yet a third mixing occurred when the soil was stored in a shed to await final placement. Analysis at this time showed no statistically significant textural differences in 100 random samples. The processed soil was 60 percent sand, 25

percent silt, and 15 percent clay with a wilting point of 7 percent and a field capacity of 18 percent by weight.

The mixed soil was weighed and placed in the lysimeters in 3-inch layers, each layer being "chopped" with spades into intimate contact with the layer beneath. The success of this filling method is shown by the resultant uniformity of the lysimeters. At the time of filling, the average dry weight of soil in each of the 26 lysimeters was 137,379 pounds, the standard deviation was 0.5 percent of this weight, and the extreme range in weight less than 2.0 percent. Mean apparent density of the soil was 1.44 grams per cubic centimeter when the lysimeters were filled.

At the time of filling, an overburden of stock soil was contained by temporary 12-inch sideboards above the design level of the lysimeters. During the subsequent settling period, the soil surfaces were protected from the weather by a 3-inch layer of excelsior held in place with wire netting. Annual surface surveys showed that 70 percent of the settling took place during the first year's exposure to wetting and drying. After 3 years, settling had become negligible and the remaining overfill soil, about 6 inches, was removed. Soil settling over the 3 year period increased the apparent density 8.3 percent—to 1.57 gm/cc.

## Computing Evapotranspiration

The lysimeters are operated to reveal differences in rainfall disposition by native plants. Rainfall disposition includes all sources of water loss from the soil-plant system; i.e., transpiration, foliar interception, and evaporation from the soil surface are included in the term "evapotranspiration." Annual evapotranspiration is computed from the formula: *Water loss = rainfall —(runoff + seepage — increase or + decrease in soil moisture)*. The design of the lysimeters permits ready determination of all factors in the formula except soil moisture.

Soil moisture has commonly been computed by weighing soil samples before and after drying. This method is prohibitively laborious on the scale required in the San Dimas lysimeters. Furthermore, the confined soil block soon would be honeycombed, destroying the carefully created uniform growing conditions. A soil moisture sampling technique was required combining reliability, ease of use, and durability in a permanent installation. The Colman fiberglass soil moisture instrument (figure 4) was developed to fulfill these needs (3, 4, 7). These instruments were installed in key lysimeters by 1952 and have been in constant use. They were calibrated first in the laboratory (9) and subsequent checks against soil moisture in the lysimeters showed no evidence of change in calibration until 1959.

Data for the determination of evapotranspiration are collected on schedules determined largely by weather. Soil moisture readings are taken before and after storms and once a week during rainless periods. Rates of inflow into seepage and runoff tanks are recorded during storms for representative lysimeters; total catch is recorded after storms for all lysimeters. Weekly phenologic observations also are recorded. All of these data are summarized currently by storm and annual totals.

## The Lysimeter Research Program

The lysimeters have gone through three periods of development: (1) The overfill period, 1937-40; (2) the grass cover period, 1940-46; and (3) the long-term native species test, 1946 to the present. During the first period, the soil surfaces were maintained free of vegetation and protected from erosion by an excelsior mulch. Rain, runoff, and seepage were measured so that inconsistencies between lysimeters could be discerned. The principal purpose of this preliminary period, however, was to permit the soil to settle.

After the removal of the surplus soil, an annual grass (*Bromus mollis*) was planted in 1940 to start the second lysimeter research period. The use of this species, important in central California range lands, had a threefold purpose: (1) It would provide an opportunity to detect consistent or erratic differences between lysimeters under a nearly uniform vegetation, (2) information would be obtained as to the grass and its water economy,

**Figure 4.** (Left) A single Colman fiberglass moisture instrument.

**Figure 5.** (Above) Grass cover in lysimeters, two, three, and four during 1942. Lysimeter one is bare.

and (3) profile development would begin in the structureless soil. After the first seeding, the grass was allowed to reseed naturally inside the lysimeters and in the surrounding border strips (figure 5).

Since the soil settling period, lysimeter number 1 has been maintained free of all vegetation. By this means it is possible to evaluate soil surface evaporation, a quantity inseparable in other lysimeter data from soil moisture losses lumped together as evapotranspiration.

The final and current research period started in 1946 when the grass cover was replaced by four chaparral species and Coulter pine, planted in groups of five contiguous lysimeters (table 1). Plantings also extended 20 feet north and 50 feet south into buffer strips adjacent to the lysimeter line.

**TABLE 1**
**Plants in The San Dimas Lysimeter**

| *Lysimeter number* | *Common name* | *Botanical name* (11) |
|---|---|---|
| 1 | Bare | |
| 2, 3 | Perennial grasses | *Stipa lepida Hitchc.*<br>*Poa scabrella (Thurb.) Benth.*<br>*Mellica imperfecta Trin.*<br>*Agropyron caninum (L.) Beauv.* |
| 4-6 | Buckwheat | *Eriogonum fasciculatum var. foliolosum Nutt.* |
| 7-11 | Chamise | *Adenostoma fasciculatum Hook. and Arn.* |
| 12, 13 15 | Hoaryleaf ceanothus | *Ceanothus crassifolius Torr.*[1] |
| 14, 16 | Sugar bush | *Rhus ovata Wats.*[1] |
| 17-21 | Scrub oak | *Quercus dumosa Nutt.*[1] |
| 22-26 | Coulter pine | *Pinus coulteri Lambert* |

[1] Broad-leaved species.

**TABLE 2**
**Average Annual Rainfall Disposition for 5 Consecutive Years of Sub-Average Rainfall.[1] San Dimas Lysimeters October 1, 1952, to September 30, 1957.**

| *Vegetation* | *Rainfall* | *Surface runoff* | *Infiltration* | *Seepage* | *Evaporative loss* |
|---|---|---|---|---|---|
| | *Inches* | *Inches* | *Inches* | *Inches* | *Inches* |
| Bare | 20.6 | 12.7 | 7.9 | 0 | 7.4 |
| Pine | 20.6 | 4.9 | 15.7 | 0 | 15.4 |
| Chamise | 20.6 | 3.6 | 17.0 | 0 | 16.9 |
| Grass | 20.6 | 3.4 | 17.2 | 1.8 | 15.7 |
| Buckwheat | 20.6 | 3.0 | 17.6 | 0 | 17.6 |
| Scrub Oak | 20.6 | 2.8 | 17.8 | 0 | 18.0 |
| Ceanothus | 20.6 | 2.5 | 18.1 | 0 | 17.9 |

[1] Rainfall during the period ranged from 16.01 to 27.39 inches, always less than the 25-year annual average of 27.6 inches.

**TABLE 3**
**Average Annual Rainfall Disposition During a Year of High Rainfall. San Dimas Lysimeters October 1, 1957, to September 30, 1958**

| *Vegetation* | *Rainfall* | *Surface runoff* | *Infiltration* | *Seepage* | *Evaporative loss* |
|---|---|---|---|---|---|
| | *Inches* | *Inches* | *Inches* | *Inches* | *Inches* |
| Bare | 48.4 | 39.1 | 9.3 | Trace | 8.7 |
| Buckwheat | 48.4 | 20.9 | 27.5 | 2.5 | 24.3 |
| Grass | 48.4 | 20.3 | 28.1 | 11.5 | 16.5 |
| Scrub oak | 48.4 | 19.4 | 29.0 | 3.8 | 24.8 |
| Chamise | 48.4 | 18.8 | 29.6 | 3.6 | 25.5 |
| Ceanothus | 48.4 | 18.6 | 29.8 | 5.1 | 23.6 |
| Pine | 48.4 | 17.0 | 31.4 | 6.3 | 25.1 |

Since 1946 two changes have been made in the planting arrangement. In 1951 buckwheat in two lysimeters was replaced with a mixture of native grasses. Hoaryleaf ceanothus has not done well in confinement and in 1952 was replaced in two lysimeters with sugar bush.

## Results Since Crown Closure

Since the grass cover period, lysimeter 1 has behaved very differently from those covered by vegetation. The bare soil has lost a considerable amount of fine material and developed a hard crust. On planted surfaces, erosion or compaction seldom occurred. The infiltration rate of vegetated soils increased; that of the bare soil remained at the low value typical of all lysimeters during the excelsior cover period.

By 1952 the vegetation on most of the lysimeters had formed a canopy over the soil surfaces. Vegetation profoundly influenced the disposition of rainfall during the drouth period 1952-57 (table 2).

Water yield was in the form of runoff from all but the grass-covered lysimeters, which invariably yielded some seepage. Runoff was from three to five times greater on bare than on vegetated soils. Infiltration into the bare soil was only 38 percent of the rainfall; under vegetation it varied from 76 to 88 percent. Evaporation and transpiration each year used essentially all moisture available in soils covered by woody plants. Colman-unit readings showed that only under grass did the entire 6 feet of soil become wetted above field capacity and thereby yield seepage flows.

The amount of water in the soil under bare and vegetated conditions differed markedly during a typical low rainfall year (figure 6). Infiltration was least into bare soil, but as water was lost only by evaporation there was a minimum of seasonal soil moisture change. Infiltration into scrub-oak-covered soils was greatest, but because this plant used all the water available to it, there was a maximum of seasonal moisture change.

Results during the dry 1952-56 period show that:

- Water yield was entirely surface runoff except for a small amount of seepage under the grass cover.
- Woody plants used all available moisture during each dry season, while about 10 inches of available water remained under bare and grass-covered soils.
- During the winter and spring, pine and grass dried the soil more rapidly than did scrub oak.

During 1957-58 rainfall was 48.4 inches, more than 20 inches above normal for the 25-year period of record. Table 3 shows how cover species influenced rainfall dispositions during this abnormally wet year.

Under the conditions of these studies, comparison of tables 2 and 3 indicate that:

1 Regardless of amount of rainfall, the bare soil never absorbed more than 9 inches of rainfall.

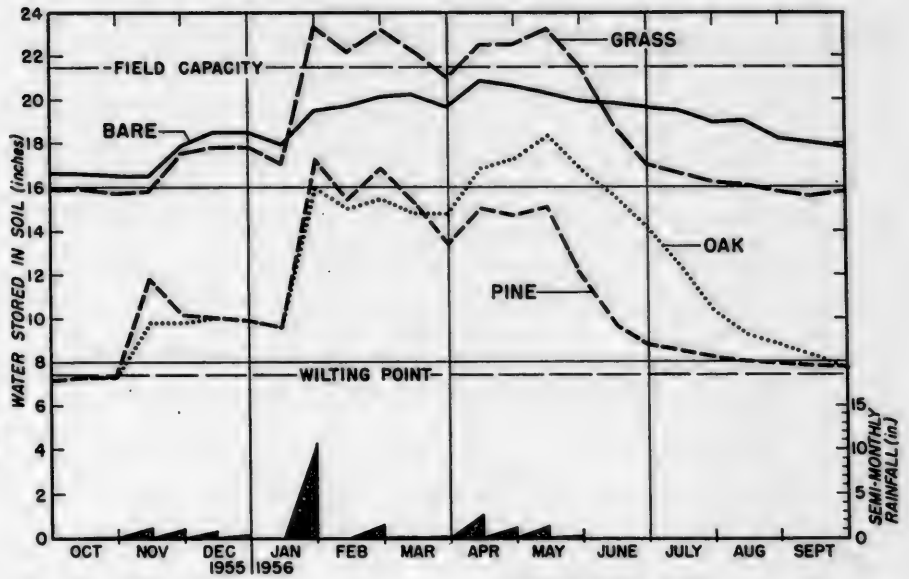


**Figure 6. Seasonal variations of water in the lysimeter soil during 1955-56, a typical drouth year.**

**2** Each plant cover tested has increased infiltration. During the dry years scrub oak was most effective, but in the wet year infiltration was greatest under pine.

**3** Seepage yields invariably were much greater under grass than under any other plant cover tested.

**4** Annual evapotranspiration losses from the grasses tested varied but little from 16-inch average shown in the tables, though Colman-unit readings showed that additional water was available in the lower 2 feet of lysimeter soil.

**5** The experiment has not revealed how much water the woody plants might use if soil moisture were available throughout the year.

## Conclusions

Few of the concepts basic to the lysimeter experiment will be changed in the near future. Soil properties are known to be changing but the lysimeter soil remains an experimental asset of great value. The plant cover is yet relatively young. Irrigation may be used to hasten results inevitably delayed by the vagaries of weather. There is evidence that Colman-unit calibrations are drifting, and these instruments will be replaced with access tubes permitting soil moisture determinations with the nuclear scattering device (13).

The lysimeter data of most interest to watershed managers concerns the modest use of soil moisture by grass as compared to the greater use by woody plants. These results, obtained under laboratory conditions, have been strengthened as well as qualified on larger plots growing grass, brush, and trees under more natural conditions (1). Entire San Dimas watersheds now are being managed to further compare the water economies of grass and natural cover (10, 14).

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# Returns from Domestic Ryegrass Cover Crop

DIP N. RAM AND P. J. ZWERMAN

*Roots and tops of domestic ryegrass used as a cover crop yielded one ton of dry matter when the crop was heavily fertilized and only one-half this amount under moderate fertilization. Depending upon the date of turning under, the dry matter yield could be increased more than twofold. Nitrogen, phosphorus and potash content of the dry matter were more than doubled by heavy applications of fertilizer.*

IN INTENSIVE CROPPING SYSTEMS for vegetables and corn in the northeastern United States, domestic ryegrass is often used as a cover crop. Decrease of leaching losses, more organic matter returned to the soil, and improved soil physical condition are benefits of this practice.

Results of other investigations have shown that fertilization of domestic ryegrass increases its dry-matter yield, the percentage of nitrogen, phosphorus and potash it contains, and the total amount of these nutrients returned to the soil (1). Turning ryegrass under late in the spring, rather than early, results in a much higher dry-matter yield (2, 3).

The percent of nitrogen in the plant decreases as the time of plowing ryegrass under is delayed. However, the total amount of N, $P_2O_5$ and $K_2O$ returned to the soil is greatly increased because of the larger total of dry matter produced (3).

## Materials and Methods

An existing experiment started in 1951 on Honeoye silt loam at Marcellus, New York, (4) was used for the cover crop and fertility aspects of this study. The design was split-plot in random complete blocks. The five treatments used included two check plots (one was started in 1951 and one in 1956), one plot with cover crop, and two plots with cover crop plus woodchips. The five-year rotation was sweet corn, beans, tomatoes, cabbage, and peas. The split-plot treatments were the levels of fertilization of the main crop.

Two levels of fertilization were selected: (1) The recommended amount of fertilizer for various crops (as given in table 1), plus 100 pounds additional nitrogen per acre annually (heavy fertilization), and (2) one-fourth of the recommended amount of fertilizer (moderate fertilization). The purpose of the different fertilization levels was to study the nature and significance of interactions with main plot treatments.

**TABLE 1**
**Recommended Amounts of Fertilizers for Different Crops, Marcellus, New York**

| *Crops* | *N* | *$P_2O_5$* | *$K_2O$* |
|---|---|---|---|
| | *Lbs./A* | *Lbs./A* | *Lbs./A* |
| Sweet Corn | 30 | 60 | 30 |
| Beans | 30 | 60 | 30 |
| Tomatoes | 80 | 160 | 80 |
| Cabbage | 100 | 200 | 100 |
| Peas | 30 | 60 | 30 |

Other aspects of managing domestic ryegrass, such as the date and depth of plowing it under, were studied in an experiment on a field made up of a complex of Lima, Kendaia, Cambria, and Lyons silt loams at Aurora, New York.

In both experiments the domestic ryegrass was seeded at the rate of 25 pounds per acre during last cultivation of the principal crop.

Tops were harvested on May 16, 1958, at Marcellus from two one-square-foot areas. The locations of these areas were selected at random on each sub-plot. Samples of tops from replicates were composited and oven-dried to constant weight at 70°C.

One soil core sample was taken with the Uhland (6) sampler per square foot of area harvested for dry-matter yields of tops. This sample was taken from the 0-3 inch depth. It was washed thoroughly, and the roots were collected and were oven-dried to constant weight at 70°C. Since roots were not ashed, weights were reduced for any soil adhering to them by using a correction factor of 25 percent (7).

Yields of tops and roots at the Aurora experiment were similarly determined on April 30, May 17, and May 23. All tops and root samples were analyzed for N, $P_2O_5$ and $K_2O$ content by the Analytical Laboratory of the Cornell Agronomy Department. Soil samples taken in the fall of 1957 from plots at the two locations were analyzed for organic matter content, for total nitrogen, and for readily available phosphorus and potash (5).

## Research Results

The effects of the two levels of fertilization in the Marcellus experiment on the total dry-matter yield of tops and roots of the domestic ryegrass are shown in figure 1. Heavy fertilization increased the dry-matter return of tops by 125 percent and of roots by 55 percent, as com-

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*This article is a contribution from the Department of Agronomy, Cornell University and is Agronomy Paper No. 479.*

pared to the moderate fertilization level. Yields were low because of high mortality of the grass during the winter.

Fertilizer effects on the composition of tops and roots are shown in figure 2. Heavy fertilization increased the percentage of N, $P_2O_5$, and $K_2O$ in the dry matter. The increase in yield over the moderate level of fertilization for tops was N—32 percent, $P_2O_5$—87 percent, and $K_2O$ —35 percent, and for roots was N—12 percent, $P_2O$—54 percent, and $K_2O$—42 percent. Figure 3 shows that tops and roots returned a much larger amount of the three fertilizer elements, under heavy fertilization, than were returned under the moderate level of fertilization.

The different dates of plowing in the spring affected total dry-matter yield, composition, and the return of the total amounts of N, P, and K to the soil. Results are shown in figures 4, 5 and 6 respectively. As the date of plowing was delayed, the amount of total dry-matter plowed under increased, and the percentage of N, $P_2O_5$ and $K_2O$ decreased in both tops and roots. However, the total amounts of these nutrients to the soil increased significantly. All of these effects were more pronounced in tops than in roots.

The cumulative effects of the use of domestic ryegrass and woodchips for seven years on the content of soil organic-matter are given in table 2.

The domestic ryegrass maintained the soil organic-matter content at a significantly higher level than the 1951 check treatment. It was 9 percent higher under heavy fertilization, and 18 percent higher under moderate fertilization. The cover crop plus woodchips were even more effective in maintaining soil organic matter content. Beneficial effects of the heavy fertilization were not evident on plots receiving woodchips.

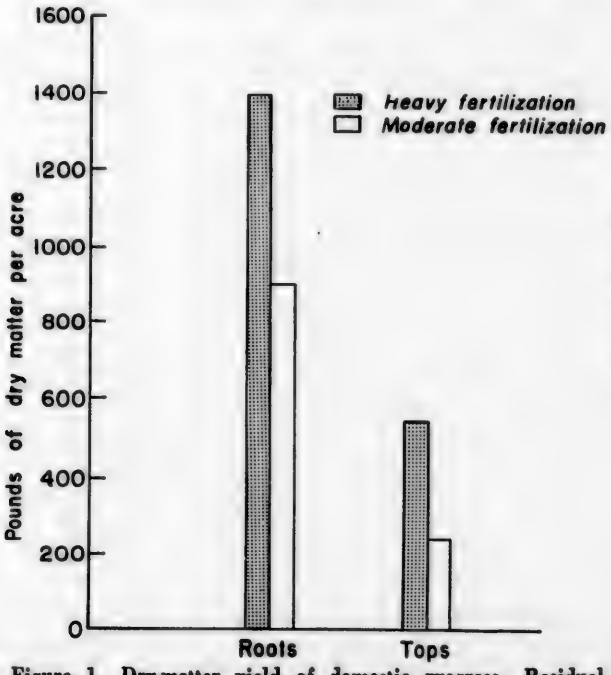


Figure 1. Dry-matter yield of domestic ryegrass. Residual effects of two levels of fertilization on Honeoye silt loam at Marcellus, N. Y., Spring 1958.

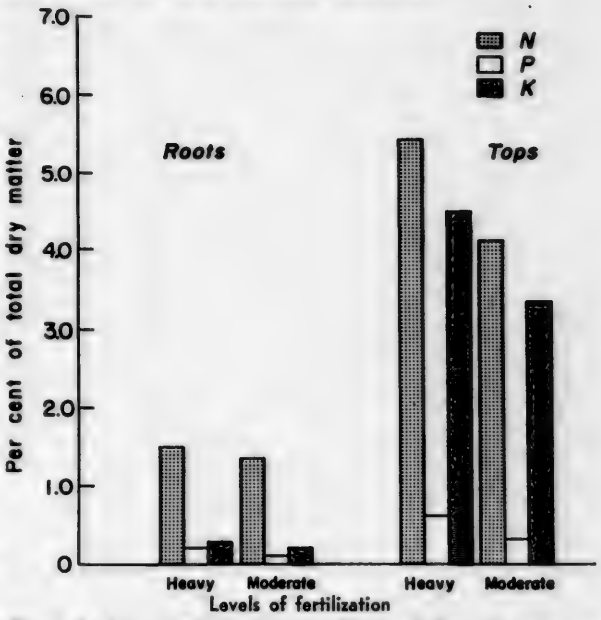


Figure 2. Composition of roots and tops of domestic ryegrass. Residual effects of two levels of fertilization on Honeoye silt loam at Marcellus, N. Y., Spring 1958.

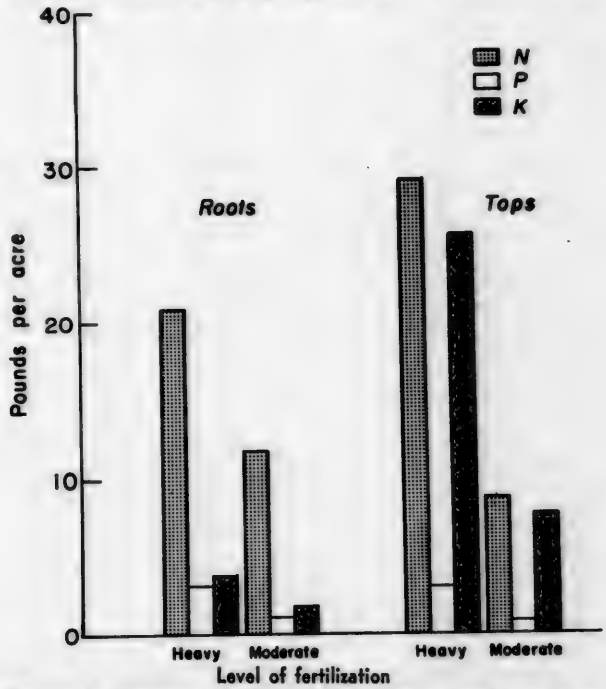


Figure 3. Amounts of nitrogen, phosphorus, and potash returned to the soil through roots and tops of domestic ryegrass. Residual effects of two levels of fertilization on Honeoye silt loam, Marcellus, N. Y., Spring 1958.

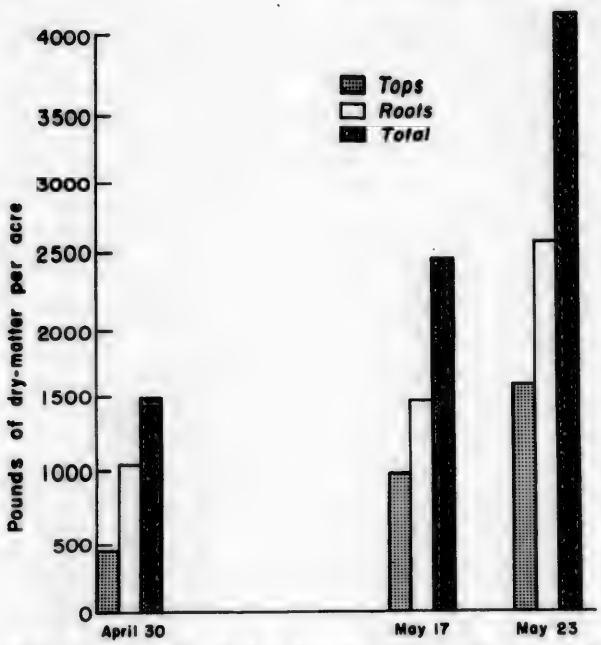


Figure 4. Dry-matter yield of domestic ryegrass tops and roots for different dates of sampling at Aurora, N. Y., Spring 1958.

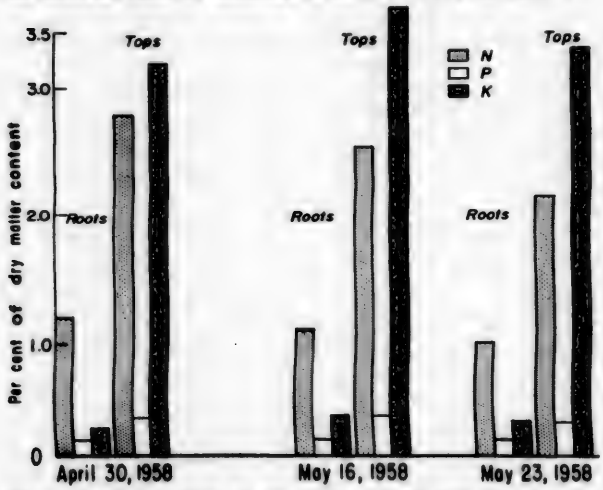


Figure 5. Composition of tops and roots of domestic ryegrass at different dates of sampling, Aurora, N. Y., Spring 1958.

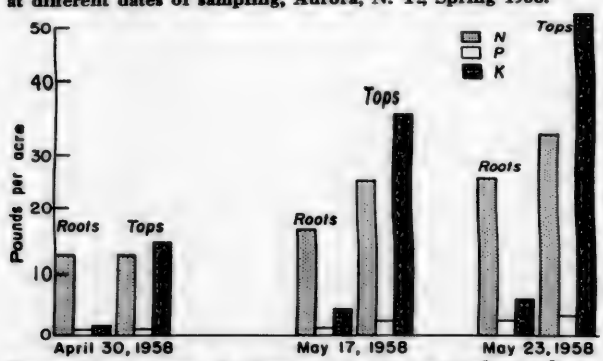


Figure 6. Amounts of nitrogen, phosphorus, and potash returned to the soil by tops and roots of domestic ryegrass on different sampling dates, Aurora, N. Y., Spring 1958.

TABLE 2
Organic-Matter Content of Soil Under Different Soil Treatments, Marcellus, New York

| Treatment | Spring, 1951 | Fall, 1957 | |
|---|---|---|---|
| | | Heavy fertilized | Moderately fertilized |
| | Percent | Percent | Percent |
| 1951 Check | 4.22 | 3.97 | 2.63 |
| Domestic Ryegrass | 4.12 | 3.26 | 3.10 |
| Domestic Ryegrass plus Woodchips plowed under. | 4.05 | 3.70 | 3.73 |
| Domestic Ryegrass plus Woodchips top dressed. | 4.00 | 3.47 | 3.47 |

The cumulative effects of these treatments on the nutrient status of the soil were also related to the soil organic-matter content. For example, soil on the cover crop plots contained 13 percent more total nitrogen than the checks.

## Results Analyzed

Greater quantities of plant nutrients were available to domestic ryegrass where main crops were heavily fertilized. These nutrients were utilized by the cover crop during the fall and following spring. They increased domestic ryegrass total dry-matter yield, the percentage of N, $P_2O_5$ and $K_2O$ it contained, and finally, the return of larger total amounts of nitrogen, phosphorus and potash to the soil. These results are substantiated by findings of App et al. (1), and Davis (3). The consistent return, of about 1⅓ tons of organic materials on a dry weight basis per acre per year through tops and roots, and of plant nutrients contained in them, maintained the levels of the soil organic matter and fertility at a higher level than the checks. The more favorable environmental conditions for plant growth after April 30, 1958, increased dry matter yield from April 30 to May 23 by about three times. Britt et al. (2) also found similar results.

Domestic ryegrass utilizes plant nutrients during seasons when the soil would normally lie idle. In that way, it decreases loss of nutrients through leaching. It utilizes, returns, and conserves greater amounts of plant nutrients when it is heavily fertilized.

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# Fish and Wildlife in Small Watersheds

JAMES T. McBROOM

***When the original Watershed Protection and Flood Prevention Act was signed into law in August 1954, it was well received by most fish and wildlife conservation interests. Public Law 566, as the Act was commonly known, seemed to offer considerable opportunity for benefits to fish and wildlife habitat within the framework of improved land use and water management measures.***

THIS INITIAL OPTIMISM was borne out by experience during the first two years of its operation. As watershed work plans became available for analysis, it was apparent that some of them contained water management features most favorable to fish and wildlife. Many soil conserving practices recommended also improved wildlife habitat.

In other cases, measures recommended in work plans were more or less neutral in their immediate effects on fish and wildlife. These offered promise for the future in that they would provide a stable land-use base to which more specialized fish and wildlife management measures could later be applied. Only a few work plans —less than five percent—proposed measures that would have serious adverse effects on fish and wildlife resources, and these largely by drainage of wetlands.

Early in the program, provision was made for a joint field review of proposed small watershed projects by the Fish and Wildlife Service and the State fish and game agencies along with the Soil Conservation Service and representatives of local organizations. Reports containing management recommendations of both agencies based on these field studies were furnished by the Fish and Wildlife Service to the State Conservationists and to the local project sponsors. These reports provided a basis for consideration of fish and wildlife interests in the preparation of final project work plans.

In 1956, Public Law 1018 provided amendments to the Watershed Protection and Flood Prevention Act authorizing non-agricultural water management under the program without Federal cost-sharing. Water developments for fish and wildlife or municipal water supply could be included, provided the local sponsoring agency for the project paid all of these costs. There was, however, virtually no response to this opportunity from a fish and wildlife standpoint.

Public Law 85-624, passed in August 1958, added a new Section 12 to the Watershed Act which specifically authorized the Secretary of the Interior to make surveys and investigations for the conservation and development of fish and wildlife in small watersheds, and to participate actively in planning works of improvement for that purpose.

Public Law 85-625, passed a month later, authorized Federal cost-sharing on account of fish and wildlife benefits.

These two amendments may, I believe, have a far reaching effect on fish and wildlife resources on American farm lands.

To be eligible for Federal technical and financial assistance, the fish and wildlife measures proposed as a part of work plans must meet the following qualifications:

1 They must be closely associated with the conservation, development, utilization and disposal of water.

2 They must be concerned with improving habitat for the breeding, growth, and development of fish and wildlife rather than the harvest thereof. Such development as access roads, parking areas and boating facilities cannot be cost-shared. Also, facilities for artificial propagation of fish and wildlife are not eligible for assistance.

3 The measures proposed must result in benefits of public significance—not just private benefits. This means that public access for use must be provided by the sponsoring local organization or the State through fee title acquisition or perpetual lease of needed lands.

Under the three general provisions mentioned, the eligible fish and wildlife measures may be cost-shared by the Federal Government through the Department of Agriculture at rates up to 50 percent of their installation cost. The four major groups of measures for fish and wildlife conservation authorized for Federal cost-sharing are as follows:

- *Storage Capacity in Reservoirs*

Additional reservoir storage capacity may be provided over and above that provided for other project purposes.

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This, in effect, means enlargement of the reservoir to provide deeper water and larger surface acreage for fishery management, waterfowl use, or for release downstream. To cite an example of the latter, such stored water could be diverted by ditches to reflood a publicly-owned waterfowl refuge and management area located at some distance from the reservoir, or even outside the watershed. Since all land for reservoir sites under the program must be furnished by the local group without cost to the Federal Government, the expense for additional land in the reservoir cannot be cost-shared.

A reservoir also may be constructed solely for fish and wildlife under the program if it is a part of a multiple-purpose small watershed project.

- *Modifications of Reservoir Structures*

Features for fish and wildlife development may be incorporated in structures to be constructed as a part of a project or may be built as modifications of existing structures to provide seasonal regulation of water, or to maintain stable water levels in natural or artificial lakes. Also, fish ladders and fish shelters may be constructed where they are needed as part of a fishery management program.

- *Stream Channel Improvements*

These include measures to stabilize stream banks such as sloping, riprapping, vegetative plantings and construction of jetties. They also include planting trees and shrubs to shade the water surface, channel deepening, and construction of sills and other facilities to create pools suitable for fish development. Fencing stream bank areas and related practices, commonly used by Federal and State fish and wildlife agencies to improve fish and wildlife habitat in and along streams, may be employed.

- *Marsh and Pit Development*

New marshes may be created or existing marshes may be improved as breeding habitat for waterfowl and fur animals, by construction of pits and islands, by level ditching and by fencing against livestock.

These four general categories of specific measures for fish and wildlife may be applied in any small watershed where conditions are appropriate. No specific economic justification is required beyond the willingness of the local project sponsors to bear 50 percent of the installation cost. Where combined with developments for other project purposes, installation cost is assigned on an incremental basis. That is, no joint costs of the project need be allocated to fish and wildlife. Furthermore, it is permissible that funds available to local sponsors from State fish and game agencies or other sources within or outside the watershed may be used to pay the non-Federal share of installation costs for fish and wildlife measures. This is an important provision since all State fish and game agencies under the Pittman-Robertson and Dingell-Johnson Acts receive substantial sums of Federal-aid funds as reimbursement for their expenditures on approved fish and wildlife projects.

### Activity in Small Watersheds

As was mentioned earlier, legislation authorizing Federal cost-sharing of specific fish and wildlife developments in small watershed projects became effective in September 1958. Watershed Memorandum SCS-40 containing the Department of Agriculture's criteria and standards for providing assistance was released in February 1959. Information on the regulations governing this phase of the small watershed program thus has been available to local project sponsors and to other inter-

**Drawdown area of a flood detention reservoir, Sittendown Creek Watershed, Georgia. This area was planted to browntop millet in July to supply waterfowl food.**

**Dugout and dam combination constructed on farm of Soil Conservation District Cooperator. The site is on native grass land, and when it is full the water backs up 500 feet. In addition to providing water for livestock this owner has developed an excellent wildlife habitat. Ducks are hatched in the lush grass and a brood can be seen on the water.**

*SCS Photo by McLean*

ested agencies for a very short time. What has been the response?

Four small watershed projects approved for construction include specific developments for fish and wildlife which are being Federally cost-shared. Three additional projects previously approved for construction contain recreational developments that also will enhance fish and wildlife resources. Amendment of the work plans for these three projects is expected so that Federal cost-sharing will be made available for that portion of the construction expense logically assignable to enhancement of fish and game.

Also, in at least 25 other projects approved for planning, considerable local interest in fish and wildlife has been reported.

I would be among the first to agree that this does not look like a sensational response, considering all that has been said and written about the opportunities for fish and wildlife enhancement in small watersheds. However, I also will be the last to admit that the record to date necessarily sets the pace for future participation.

Let us take a closer look at the four watersheds where fish and wildlife developments have been included on a cost-share basis.

The Flat Creek Watershed, Arkansas, is perhaps the outstanding example. The Arkansas Game and Fish Commission is a co-sponsor of the project and assisted in development of the work plan.

Major developments for fish and wildlife in the Flat Creek Project consist of a multiple-purpose structure to store additional water in one of the five floodwater retarding reservoirs, and a diversion channel 4.6 miles long from this reservoir to a wild management area. This 9,000-acre wildlife area was purchased and is being administered by the Arkansas Game and Fish Commission primarily as a waterfowl refuge and shooting area. When additional water is needed in this area, it may be released from the reservoir into the upper end of the diversion channel and by gravity flow be discharged into the area to be flooded.

In the Mud River Watershed, Kentucky, the Kentucky Fish and Wildlife Resources Commission has become a project co-sponsor. An 826-acre fishing lake will be constructed with cost-sharing by the State and the Federal Government.

In Thompson Creek Watershed, Tennessee, one of the floodwater retarding reservoirs will be modified to provide a lake of 184 surface acres, primarily for fish habitat. The Tennessee Game and Fish Commission is a co-sponsor for this project and will pay the non-Federal share of the cost for fish and wildlife development.

In Louisiana, the citizens of the town of Plain Dealing felt the need for added recreational development in Upper West Fork Cypress Bayou Watershed. Through increased city taxes, funds were raised to increase the storage capacity of one of the proposed floodwater retarding reservoirs from 20 acres on private lands for flood control only, to a 98-acre reservoir with public access. The Louisiana Wild Life and Fisheries Commission will provide management assistance so that maximum fishing benefits can be realized.

These four cases illustrate the community benefits in the form of enhanced fish and wildlife resources that are possible under the small watershed program. They show that, where available and appreciated, opportunities for achieving such benefits can be realized through the joint efforts of Federal planning agencies, State conservation agencies and interested local groups. Why is it then

that there are only four cases where full advantage of existing opportunities has been taken?

The main reason, I believe, is the problem of public access. The Soil Conservation Service has decreed, very properly, that public access is a requirement for Federal cost sharing on account of fish and wildlife benefits. Impoundments in the small watershed program are normally built on private lands, which the owner retains. In fact, the attractiveness of a lake on his property is the *quid pro quo* for getting many a landowner to agree to furnishing the easement on his property for a small watershed impoundment. In most cases, the landowner seems reluctant to permit the public to cross his land and use his shorelines as a condition for the sponsoring local group to get Federal cost sharing for fish and wildlife.

Another reason is that benefits resulting from enhancement of fish and wildlife resources are still unexplored territory for many individual landowners. Community development of such resources with or without Federal assistance is still a pioneer effort. One cannot expect universal recognition and appreciation plus action in a program involving farmers, sportsmen, State agencies, and Federal bureaus in a short time.

### Developing Interest

Most State fish and game agencies are aware of the opportunities for fish and wildlife conservation under the small watershed program. In many instances, however, the funds presently available to these State agencies for fish and wildlife enhancement work are already committed in support of established programs. When and if it is apparent that State funds expended for fish and wildlife in small watershds are a superior investment, more financial support from this source will be forthcoming. Such program reorientation takes time, and must be keyed to the resource needs and sportsmen's demands peculiar to each State.

**Rock barrier and Denil fishway installed according to Washington State Fisheries recommendations to permit upstream movement of fish and prevent degrading of gravel bottom from the unexcavated area of Hansen Creek above.**

*SCS Photo by Harms*

The opportunities for fish and wildlife developments and the benefits that can result from them have not been adequately publicized. This is something that Federal Bureaus and the respective State fish and game agencies can do something about, especially where sportsmen are concerned.

For some time we in the Bureau of Sport Fisheries and Wildlife have felt the need for an illustrated leaflet, describing the various fish and wildlife conservation and development measures applicable to small watershed projects. Such a leaflet would have considerable information value and could be freely distributed to local people, including sportsmen, in small watershed areas. Currently we are drafting such a publication, and hope that it may have some influence in getting more interest at the local level.

It must not be forgotten that this is a long-term program which will have cumulative effects. It will be some years before these projects are completed.

### Looking to the Future

There is one possible source of funds in support of local cost-sharing for fish and wildlife in small watershed projects that so far has not been utilized to any great extent. I refer to groups of sportsmen, organized and unorganized, living in or adjacent to small watersheds. Eventually such groups may play a prominent role and it is fitting that they should.

There will be many instances in the course of the watershed program where projects will have potential benefits for fish and wildlife. Some of these may not be of such size or location as to be attractive to State fish and game departments or else the departments simply may not have sufficient funds to undertake every such development. Under the cost-sharing provisions, many developments may be well within the economic reach of local sportsmen's groups, civic organizations, watershed districts, counties, towns or others. The town of Plain Dealing, Louisiana, is an example of this. There should be many other instances where small, public-spirited groups can acquire the necessary easements in cooperation with the sponsoring organizations or contribute a share of the construction cost thereby securing for their community a worthwhile public fishing or hunting area.

The Small Watershed Program, with the legal tools available, can fulfill its early promise as one of the best fish and wildlife programs sponsored by the Federal Government if we but use its provisions wisely.

# Stripcropping Pacific Northwest Grainlands

THOMAS I. WILSON

***Across the face of the grain producing lands in the Pacific Northwest a new pattern of farming is developing. The corduroy ribbons of stripcropping stretch as far as eye can see in some areas. The first field of contour stripping in eastern Oregon was established in 1938 on the Frank Anderson ranch near Heppner. This was the beginning of a practice that was eventually to envelop a large area.***

ABOUT one-half of the Pacific Northwest's eight million acres of cultivated land is in grain; the rest lies fallow each year. Wind and water erosion still are taking excessive amounts of soil from these dry-farmed lands. Erosion is caused chiefly by runoff resulting from rainstorms falling on freshly prepared seedbeds or summer fallow, by runoff of excess fall and winter moisture and by severe windstorms on poorly protected grainlands.

Stripcropping is a practice which gives maximum protection from wind and water erosion on cultivated lands. The land is broken up into strips across the slope or at right angles to prevailing winds so that only a narrow strip of land is open to erosion at any one time. It is most effective when used with a complete conservation program of stubble mulch, rough tillage, contouring, grass-legume rotations and effective water disposal practices.

Four types of stripcropping are used:

### *Wind Stripcropping*

Wind strips are uniform in width, usually straight, and laid out as nearly as possible at right angles to prevailing winds. Widths of strips varies with soil types, cropping and tillage system, and anticipated wind velocities. Minimum width usually is not less than 75 feet, and maximum width should not exceed 240 feet. Strips would be narrowest on coarse and light textured soils. In the West Umatilla Soil Conservation District in eastern Oregon, experience shows that effective strips may vary from 120 to 240 feet, depending upon the soil type.

### *Contour Stripcropping*

Contour strips are at right angles to the natural slope of the land. They are used to control water erosion and also may be effective on sloping land where wind erosion is serious. They are often uneven in width depending upon the uniformity of slope. Maximum strip width in eastern Oregon should not exceed 240 feet on slopes under 12 percent. Width of strips on slopes greater than 12 percent is determined by the formula:

$$\frac{30 \times 100}{\text{percent of slope}}$$

Strips, regardless of degree of slope, seldom are less than 120 feet wide because of the large equipment used in the area.

### *Field Stripcropping*

Field stripcropping is similar to wind stripcropping except that uniform strips are placed at right angles to the general slope of the land rather than at right angles to the wind. They do not curve to conform to the contour in crossing drainageways. This system is useful for general sloping areas where topography is too irregular for practical contour stripcropping. Most of the layouts for water erosion control are combinations of contour stripcropping and field stripcropping. It is impractical on many fields to adhere strictly to the contour because too many irregular strips result. Land with a 20 percent or more slope is avoided for crop production purposes and uneven strips are held to a minimum.

### *Buffer Stripcropping*

Buffer strips of grass or grass-legume mixtures are laid out between strips of crops in regular rotation. They may be wide or narrow and may be of even or variable widths. They may be placed only on the steep, badly eroded parts of a slope or at more or less regular intervals on the slope. The buffer strips are used to give more protection from erosion than is afforded by a solid planting of grain or intertilled crops. They are particularly useful on grain-fallow ranches producing livestock. They allow full use of stubble pasture during the years the field is in crop and provide considerable protection when the fields are in fallow. In addition, they may be used to take up uneven areas between contour strips making the strips in production easier to farm.

## Advantages of Stripcropping

1 The greatest advantage of stripcropping is its effectiveness in conserving soil, moisture, and fertility. Runoff becomes serious on water-logged, unprotected fields, particularly on long slopes. Losses are reduced if a barrier is placed in the path of the water. If a fall chiselled stubble strip lies below a strip of fallow or fall seeded wheat, the water and soil losses from the fallow or seeded grain strip often can be reduced or eliminated in the stubble land.

2 Contour strips provide permanent guide lines for contour cultivation and use of this practice helps in-

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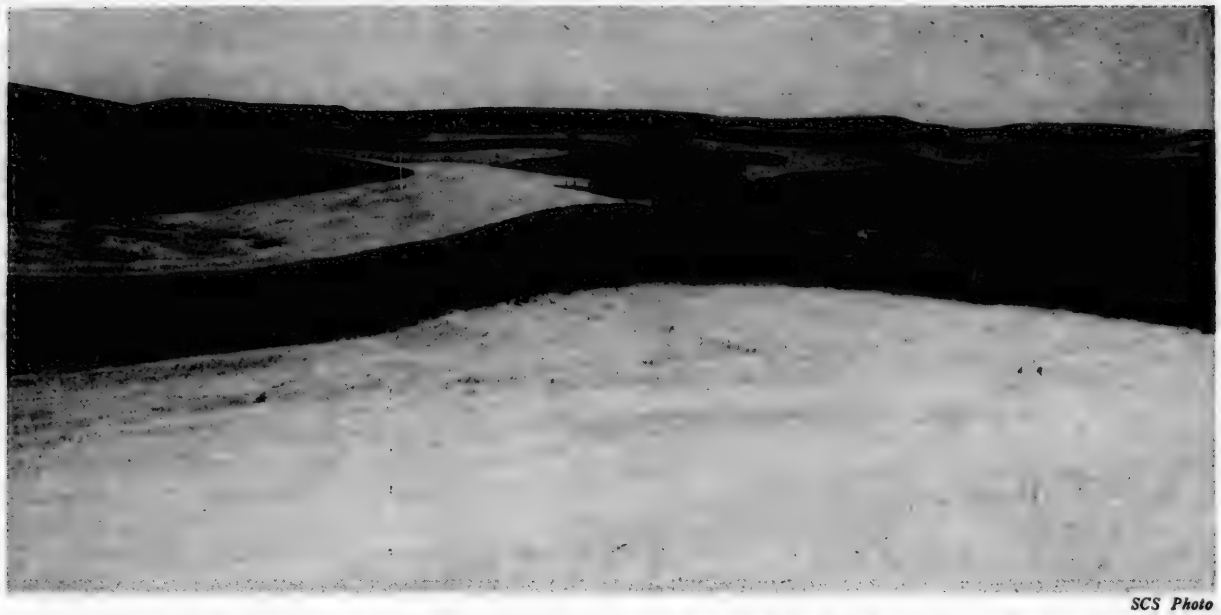

SCS Photo

**Strips of grain and fallow ground 120 feet wide on the Scott Barr farm near Edwall, Washington.**

crease yields. Paul Brown and Al Bunch, farmers in the Heppner Soil Conservation District in Oregon, have effected grain yield increases of 8 to 15 bushels per acre as a result of stripcropping. Bunch harvested a 38 bushel crop in 1957 from fields that were producing 18 to 25 bushels prior to stripcropping.

**3** Stripcropping provides a buffer that catches snow blown from exposed strips. Fall seeded grain fields often are blown bare of snow, while adjacent stubble fields will hold snow up to the height of the stubble. Holding snow increases moisture for subsequent crops. According to E. E. Rowland, soil conservationist, farmers in the rolling hills of the Palouse country who use stripcropping, do a better than average job utilizing stubble mulch and rough seedbeds.

**4** Another advantage of stripcropping is fire protection. Each fallow strip is an effective barrier against fire losses and also an island of refuge for valuable harvest equipment.

**5** Stripcropping lends itself to crop rotations such as grain-fallow, wheat-peas, barley and sod crops. Where a conservation crop rotation is followed, it is desirable to have one or more strips for each year in the crop rotation.

**6** Farming on the contour eliminates changing gears and needless long, slow pulls up the slopes. Often it results in a cheaper, easier method of farming.

**7** At Pullman, Vern Henson says, "I am able to find the weed patches in the large field that is stripped because I am in the field at various times throughout the summer either cultivating or harvesting. There's not much chance of missing a weed patch on these strips and they are easier to get at to spray or cultivate."

**8** In some areas, having more fields is a distinct advantage. Farmers usually wait until the entire field is ready for spring work. With strips, some areas may be ready earlier than others and individual strips can be seeded between rains.

**9** Stripcropping is beneficial to wildlife in summer fallow areas. Grain and grass strips provide nesting cover and escape routes which are lacking in large expanses of summer fallow land.

**10** Stripcropping works well with any standard equipment, but some of the new equipment now available works even better. Examples are self-propelled, automatic leveling combines, power lift equipment, roll-over two-way plows, two-way disks, sweeps, and other subsurface tillage implements. Moldboards may be used successfully by leaving an unplowed area in the center and finishing the land with disks or sweeps. This eliminates dead furrows.

### Problems and Disadvantages in Stripcropping

With all these advantages, why isn't there more stripcropping in the Pacific Northwest? Obviously, there are some problems and disadvantages.

**1** It is a new system of farming, and contour stripcropping particularly requires considerable planning and technical help. The method of laying out the strips and planning access to them, as well as the equipment opera-

tion procedures require a different approach than that a farmer normally uses.

2 It may mean abandoning existing field boundaries and starting all over again. Stripcropping under wheat-fallow operations requires at least two years to establish in order to get crop acreages back in balance for part of the land must be cropped annually for at least two years or double summer fallowed.

Double summer fallow means deferring income from the land for an additional year and exposing it to erosion for two years. In the wheat-pea annual cropping area this problem is not so severe, but it is very real in the summer fallow area.

The Agricultural Conservation Program cost-sharing under which the Federal government pays part of the cost of establishing contour and wind strips helps in adjusting income during the period of establishment. However, each producer is limited as to the total yearly amount of cost sharing and this tends to limit the establishment of contour stripcropping per producer annually.

3 Steep and rough topography create additional problems in stripcropping. More correction strips, sometimes difficult to farm, are needed when slopes are not uniform. Access to areas isolated by fallow must be planned. Harvest operations and routing of loaded wheat trucks must be considered. When it is impossible to route trucks on the contour strips, access must be provided on sod waterways or other routes.

4 Another problem is the large size of farms and farm equipment. Strips must be at least twice the width or in multiples of the width of the widest equipment to be used. It is never possible to fit the strips to all equipment, but widths should be planned carefully with the farmer. Points and narrow necks must be held to a minimum where large equipment hook-ups are to be used.

5 Stripcropping means more fields and boundaries. It may mean removal of some fences and installation of others. Most farmers consider this a disadvantage because of weed infestations along the edges of strips. Pete Meyer, farming his wind strips in the light soils of the West Umatilla area, uses a Noble sweep blade to undercut weeds along the edges of the strips. This control requires two extra operations.

6 Livestock on wheat farms is a problem with stripcropping. Pasturing of stubble is limited to a short period after harvest until fall-seeded winter wheat is up. If the livestock-grain farmer wants to get the full benefits from his strips, he should make sure he has adequate pasture, other than in strips, for the major part of the grazing year. Buffer stripcropping with grass and grass-legume mixtures is best adapted for wheat-livestock operations.

## Progress in the Pacific Northwest

The first field of contour stripcropping in eastern Oregon was established in 1938 on the Frank Anderson ranch near Heppner in Morrow County. Strips of grass, fallow and grain were seeded on one field of 341 acres. This original field of stripcropping now has expanded to 10,000 acres in the Heppner Soil Conservation District. An additional 1,400 acres was stripcropped during this 20-year period, but the practice was discontinued upon change of ownership or cropping system. Soil conservation district operations have been the main initiating factor in establishing stripcropping. Most of the progress has come within the last 10 years with definite increased interest noted after each serious erosion period.

In the three main wheat growing Pacific Northwest States a total of 128,419 acres has been converted to strip-crop farming. This is compared to some 2,342,000 acres in need of stripcropping. The following table summarizes the picture in these states.

| *State* | *Acres of Stripcropping Established* | *Estimated Acres Needing Stripcropping* |
|---|---|---|
| Oregon | 26,150 | 458,000 |
| Washington | 40,269 | 990,000 |
| Idaho | 62,000 | 894,000 |
| Total | 128,419 | 2,342,000 |

## Effectiveness of Stripcropping

Measurements of soil losses by the Soil Conservation Service show stripcropping is 50 to 90 percent effective in preventing soil losses. In Sherman County, Oregon, Soil Conservation Service technician Henry Grabenhorst estimates strips of stubble, fallow and grass were 90 percent effective in 1956 on Paulen Kaseberg's ranch near Locust Grove.

In Morrow county, the land damage report, prepared by SCS in April 1956, showed stripcropping 75 to 85 percent effective compared to similar untreated areas.

On October 1 and 2, 1957, a 3-inch rainstorm during a 24-hour period at Heppner caused severe erosion on unprotected land. An erosion damage survey after the storm showed that when used together, contour farming operations, stubble mulch and stripcropping were 80 percent effective in reducing soil losses. Some cutting and soil loss occurred where gully patterns had been formed in the fields before stripcropping was established.

Stripcropping, in combination with other needed conservation practices, remains one of the most effective soil and water conservation systems. Continued intensive efforts by all public and private agencies working with land use problems are necessary to speed up the establishment of this important conservation farming practice in the Pacific Northwest dryland farming areas.

# Book Reviews

**The Chemistry and Technology of Fertilizers.** *Edited by Vincent Sauchelli. 692 pp., illus., chapter bibls., index, 1960. American Chemical Society Monograph No. 148. Reinhold Publishing Corporation, 430 Park Avenue, New York 22, N. Y. $18.00. (Reviewed by* CHARLES E. KELLOGG, *Washington, D. C.)*

This authoritative and comprehensive book on fertilizer technology has been prepared by 28 scientists, engineers, and technologists. One is with a farmers' cooperative, 2 in trade associations, 4 from government laboratories, 14 from United States industry, and 7 from industry in the United Kingdom. In addition, credit is given to others who helped with planning and editing.

Considering the detail of discussion and the many chemical reactions involved the authors (or editors) have done a good job of keeping the discussion as simple as possible. Readers with a reasonable knowledge of elementary inorganic chemistry should have little trouble understanding the book.

The 24 chapter titles are a bit long. Some 312 pages in 13 chapters cover the details of manufacturing phosphatic fertilizers, from field geology to the latest concentrated forms. Nitrogen materials are covered in the first chapter. Potash also gets one chapter. Two chapters deal with mixed fertilizers. One chapter each cover: Secondary and trace elements, especially in mixed fertilizers; drying and cooling of fertilizers; liquid fertilizers; structural and X-ray data; materials for construction of manufacturing plants; hauling equipment; and gaseous affluents from fertilizer granulation plants.

Fertilizer use in the United States has increased about fourfold since 1940. "In 1958 the value of the fertilizer tonnage sold in this country amounted to 1.25 billion dollars." Increases in content of plant nutrients have reduced handling charges and kept costs down. Quality has improved.

This reviewer believes that American agriculture will continue to be highly competitive and that farm managers will continue to increase efficiency with combinations of practices more precisely fitted to the kinds of soil they have. This will lead to more fertilizer use. If the underdeveloped countries are to develop their economies and realize their agricultural potentials, they will need large increases in fertilizers.

The authors have kept close to their title. Little is said about the relations of fertilizers to soils and crops, the economics of fertilizer use, or fertilizer law. Reserves of potassium salts and phosphatic rock are discussed.

Primarily, this book is intended for those who want to know what kinds of fertilizer materials are made and especially how they are made. It is to be hoped that the number of such people will increase.

This is the best book on fertilizer technology that this reviewer has seen. It covers the field well. The authors know their subject.

**Water Supply—Economics, Technology, and Policy.** *By* JACK HIRSHLEIFER, JAMES C. DE HAVEN, AND JEROME W. MILLIMAN. *378 pp., illus., refs., index, 1960. The University of Chicago Press, 5750 Ellis Avenue, Chicago, Illinois. $7.50. (Reviewed by* WILLIAM C. ACKERMANN, *Urbana, Illinois.)*

The reviewer found this book to be a scholarly and thoughtful work, heavily referenced, and well written. Lest this frighten the reader, it should hurriedly be added that it is absorbing reading.

Messrs. Hirshleifer and Milliman are University economists and Mr. De Haven is a physical chemist who is a senior research staff member for the Rand Corporation. Their book will be criticized, particularly by vested interests of various kinds, including irrigation interests, saline water proponents, and many engineers. The book is controversial, but is highly recommended as stimulating reading. This reviewer thinks that persons concerned with water resource policy or development would do well to read and ponder their sharp challenges to traditional thinking.

Chapters deal with the water problem, economics, market and political allocation processes. There is an extensive discussion of water rates, efficiencies, and technological features. Water law and rights are also summarized. Special case studies are made of the New York City and Southern California water supply systems. Both are criticized.

The authors feel that water enjoys a place on a pedestal while its development, distribution, and sale should be subject to economic laws. In a similar vein they believe that forecasts of future water use and resultant shortages are highly exaggerated. They regard such forecasts, commonly based upon crude extrapolations, as usually mistaken and even dangerous. They believe such forecasts are typically mistaken because they ignore the factor of water costs. In their view, as water costs rise, interest will shift to conservation techniques and processes. Water should be too "short" for wasteful or uneconomic uses.

Political bases for decisions in water resources development come in for critical review also. "Pork barrel"

and "patronage" are referred to as improper representation where the agent succumbs to temptation to further his own or his friends' interests against those whom he supposedly serves.

The authors' analysis of the New York water supply leads them to conclude that water supply decisions are typically made without proper economic analysis, this being true not only of small or backward municipalities but of our greatest cities.

**The Meaning of Wilderness to Science.** *Proceedings, Sixth Biennial Wilderness Conference. Edited by David Brower. 129 pp., illus., 1960. Sierra Club, Mills Tower, San Francisco, California. $5.75. (Reviewed by* BERNARD FRANK, *Fort Collins, Colorado.)*

For nearly 90 percent of America's population the rural outdoors has become less a work environment and more an outlet for active enjoyment, relaxation, and contemplation. Recreationists are concerned whether planners, policy makers and professional conservationists engaged in managing our farms, forests and ranges sufficiently appreciate that fact.

The strong articulate demand for hunting and fishing is of course well understood, and these pursuits receive considerable attention in resource management. Even here, however, policies are often guided by the extent of expenditures for travel, equipment, and licenses. Thus, an environment which offers these opportunities is considered economically comparable to one which yields income from timber harvesting, beef production, mineral development, etc.

But the outdoors means much more than that. Indeed, the basic concept of wilderness—in contrast to developed areas where all suitable money-producing practices are carried on—rests upon the non-monetary values.

What does wilderness have to offer? Why should so much effort be made to retain what little remains, not only on the North American continent but everywhere throughout the world? What scientific values essential to our national well-being do we Americans (and our Canadian neighbors) stand to lose by allowing wilderness to disappear?

It is to such questions that the Sixth Biennial Conference addresses itself. In his Foreword to the proceedings the editor asserts that the threats of wilderness attrition now greatly exceeded those resulting from misuse of the remaining areas; that we need to reserve wilderness, should future national emergencies require what material resources it can provide, in the same way as large commercial enterprises maintain financial reserves.

The Proceedings consist of eight major addresses by scientists eminent in ecology, biology and hydrology, the discussions, resolutions adopted, and the reprint of an unusually lucid and heart-warming philosophical dissertation on "The Call and Claims of Natural Beauty" given at London's Universitiy College in 1931.

Daniel Beard, Chief of the Division of Interpretation of the National Park Service, in the opening address, "Plants and Animals in Natural Communities," holds it futile to attempt to maintain static conditions in the wilderness. Some of the concepts of managing lands for commodities are equally applicable here. For example, it is necessary to determine the carrying capacity and to limit the number of humans accordingly, and especially to recognize the interdependence of soil, water, plant and animal life and the impact of human activity on these interrelationships. Beyond that, however, wilderness objectives depart from those suited to crops, pasture, timber, intensive recreation or industrial development. We should try to understand and accept the interdependence of natural factors as we find them, and be willing to accept what we see, hear, and feel, rather than deliberately to influence or manipulate those factors for materialistic ends.

Speaking on "Ecological Islands as Natural Laboratories," Stanley Cain extols the purpose of the conference, the only one of its kind that has addressed itself to the scientific values of wilderness, "as so little remains of this essential source of information." He defends wilderness preservation not on any economic grounds, however proper and important, or on the basis of "nose counts," but on quite different values more within the realm of religious and spiritual experience and involving a reverence for and intelligence about nature. Great opportunities exist for resource managing agencies, especially the National Park Service, to conduct basic research in these undeveloped landscapes in order to develop our knowledge and hence our appreciation of them.

Luna Leopold in "Ecological Systems and the Water Resource," agreeing with Cain on basic principles, favors research on soil, water, and geological relations, but sees no need to justify wilderness preservation only on such grounds. In these days of disappearing wilderness he finds a constantly expanding social awareness of the importance of science for maintaining and further developing society itself. Research is needed to show the changes that result from man's activities as an agent of ecologic, and even of geologic change. Many branches of science would benefit from the study of representative areas maintained as nearly undisturbed as possible. "Even the preservation of small basins typical of some of the important ecologic and lithologic types could be of significant value for hydrologic research purposes."

In "The Outlook for Conservation in Alaska," Robert Rausch points out that the United States has not yet preserved a single arctic area. "The future scientific and cultural value of such an area is self-evident, and it would be an incalculable loss if establishment of this

reservation is prevented by relatively few people concerned with the possibility of immediate economic gain." Wildlife refuges of adequate size, as well as Alaska's national parks would not only protect plant communities but also the animals these communities support. (This section is illustrated with 92 superb photographs of Alaskan wildlife and landscapes.)

Jan Cowan, speaking on "Science and the Wilderness" feels such preserves must be large enough to permit the study of natural life in the mass. Destruction of habitat necessary for the requirements of wild animals has caused their loss in great numbers. The large outdoor laboratories represented by wilderness are necessary for scientific evaluation of the forces that still confine or destroy wildlife. Human interference is minimized, hence the observations of individuals as well as groups of animals can proceed with the least possibility that erroneous results will be obtained because of man's influence. "The wilderness contributes in science not only unique opportunities for research but the constant revitalizing stimulus of contact with the mysterious."

Raymond Cowles' misgivings on "Population and Natural Resources" opens up what is among the most complex and explosive issues of our times. "I do not believe that any wilderness or nature park can proffer much hope for long-range success, unless plans for its perpetuation include in equal (and probably in even larger) measure successful campaigns for population limitation. It seems to me that it is folly to ignore the human ecology. In the study of that of other animals, in our plans for saving the primeval wilderness, or even for saving many fragments in the form of National or State Parks, we cannot succeed unless we can stem the multiplication of our population within the very near future."

Even today, "the amenities of life are dwindling away rather rapidly because of overcrowding. Even in the Sierra, and in other remote places, it is not infrequent that you may have to stand beside a trail for half an hour, waiting for a crowd of travelers to pass . . . too many people at one time in one place rather detract from the feeling that an area is a wilderness." Cowles has here hit upon a problem whose solution will require the strongest constraints and self-discipline that wilderness visitors and their organizations can muster.

Frank Darling, in the final address on "Wilderness, Science, and Human Ecology," views plant-animal complexes as energy flows in dynamic balance. We should study all the organisms which comprise the immense bio-mass represented by the invertebrate populations which are linked inseparably with the vertebrate mammals, and affect their well being. Human influences are equally great on soil organisms and the higher forms. The preservation of large units is urgent because research into the physiology of essentially pristine communities can yield results vital to the wider fields of agriculture, forestry, nutrition and soil science. We can thus better assess the capacity of different parts of the earth to withstand the drastic changes in ecological conditions associated with the production of foods and fibers.

The resolutions adopted by the Conference logically reflect the topics and points of view expressed by the participants. Wilderness in relation to education and long-range recreational planning, and additional reservations along our coasts and in Alaska, were approved along with proposals for the study of population control, wildland zoning, and the restoration of depleted timber, grass, and intensive-use recreational sites wherever they may occur.

The comments and discussions recorded in fine print add materially to the coverage of the conference except for the editor's senseless strictures on the objectivity and competency of U. S. Forest Service watershed scientists, and his gross misconstructions of their work. Thus in experimenting on how to manage forests for improved water yields, "Are we interfering with an important process of soil building or are we opening the way for sheet erosion that will strip the land down to rock, producing the kind of scenes we shrink from in the Middle East?" Soil and water scientists must wonder about the millions of acres of highly productive, well-maintained crop and pasture lands whose development required far more drastic conversions from virgin forest than are ever likely to be undertaken for water production.

Resource managers and researchers can well profit by the thoughts and evidence presented at the conference. Workers in applied research regularly encounter blocks in seeking pragmatic answers to pressing problems. It becomes necessary repeatedly to consider fundamentals. Many of these fundamentals can unquestionably be derived from laboratory research as well as from studies and experiments outside of the wilderness. Moreover some types of research cannot be undertaken without creating artificial disturbances as for example the experimental stocking of wilderness lakes with exotic species and their fertilization to test the effects on increased fish production. Nor are all scientists, even in the biological fields, sufficiently capable of understanding wilderness to be willing to adopt the primitive modes of transportation or to "endure" the relative solitude which is so uniquely a part of wilderness experience. Nevertheless our remaining undeveloped areas, by virtue of their naturalness and isolation should continue to attract the interest of creative personalities, like those who spoke at the conference. Let us hope that excessive intrusions by recreationists themselves do not succeed in wrecking the very qualities which suit wilderness so admirably for natural science research.

# Current Literature Briefs

**Watershed Management Problems in the Northern Rocky Mountain Region.** *Paul E. Packer.* 28 pp., refs., illus., 1959. Research Paper Number 57, Intermountain Forest and Range Experiment Station, Ogden, Utah.

**Forestation of Strip-Mined Land in the Central States.** *G. A. Limstrom.* 74 pp., illus., refs., 1960. Agriculture Handbook Number 166, U. S. Government Printing Office, Washington, D. C. $0.35.

**Managing Grass-Shrub Cattle Ranges in the Southwest.** *Hudson G. Reynolds.* 40 pp., illus., refs., 1959. U. S. Government Printing Office, Washington 25, D. C. $0.20.

**Man and the River—The Story of the Delaware River Basin.** 54 pp., bibl., 1959. League of Women Voters, 20 Fulton Street, Newark 2, New Jersey. $0.50.

**Progress in Watershed Management, Proceedings of the Third Annual Meeting.** 120 pp., illus., refs., diagrams, 1959. State Land Department, Watershed Management Division, 431 Arizona State Office Building, Phoenix, Arizona.

Twelve papers, each by a leading authority, make up this excellent report concerning the various aspects of water resources in Arizona.

**Longitudinal Shrinkage of Wood.** 24 pp., illus., refs., 1960. Forest Products Laboratory, Madison 5, Wisconsin.

This booklet is a revision of a 1930 publication. The last page carries a subject list of publications issued by the Forest Products Laboratory.

**Controlling Plant and Animal Pests in Farm Ponds with Copper Sulfate.** 30 pp., color illus., 1960. Phelps Dodge Refining Corporation, 300 Park Avenue, New York 22, N. Y.

**Effect of Stocking on Site Measurement and Yield of Second-Growth Ponderosa Pine in the Inland Empire.** *Donald W. Lynch.* 36 pp., illus., refs., graphs, 1958. Research Paper Number 56, Intermountain Forest and Range Experiment Station, Ogden, Utah.

**Annual Review of World Production, Consumption and Trade of Fertilizers.** 140 pp., 1960. Food and Agriculture Organization, 1325 C Street, S. W., Washington 25, D. C.

**1960 Listing of Junior Museums and Nature Centers in the United States.** 14 pp., 1960. Nature Centers for Young America, 10 East 40th Street, New York 16, N. Y.

**Silvics of Western Larch.** *Kenneth N. Boe.* 18 pp., illus., refs., 1958. Miscellaneous Publication Number 16, Intermountain Forest and Range Experiment Station, Ogden, Utah.

The silvics of the more important North American tree species are being collected and published by the U. S. Forest Service experiment stations. This report is one of seven including western white pine, ponderosa pine, lodgepole pine, western red cedar, grand fir, and black cottonwood, which are being prepared by the Intermountain station. Eventually the Forest Service will include the entire series from all stations in one publication.

**Bottomland Hardwoods Respond to Cutting.** *Leon S. Minckler,* 10 pp., illus., 1958. Technical Central States Forest Experiment Station, 111 Old Federal Building, Columbus 15, Ohio.

**Tree Species Recommended for Strip-Mine Plantations in Western Kentucky.** *Stephen Boyce and Robert Merz.* 12 pp., illus., 1959. Technical Paper 160, Central States Forest Experiment Station, 111 Old Federal Building, Columbus 15, Ohio.

**What's Known About Managing Eastern White Pine.** 69 pp., illus., refs., 1960. Production Research Report Number 38, U. S. Government Printing Office, Washington 25, D. C. (No price listed.)

This compilation contains little that is new, nor anything based on recent research. It is simply an orderly presentation of the known aspects of white pine management as set down by several noted authorities.

**A Program for Quail and Upland Game Management.** *Cyril Kabat and Donald Thompson.* 41 pp., mimeo., 1960. Special Wildlife Report Number 4, Wisconsin Conservation Department, Madison 1, Wisconsin.

This is the management section of a report on all studies of quail, related species and their habitat conducted in Wisconsin from 1929 to 1960. The last 18 years of the study were conducted by the authors. It will be some time before the complete report will be available.

**Recording Tree Defects in Stereo.** *David Worley and Martin Dale.* 12 pp., illus., 1960. Technical Paper 173, Central States Forest Experiment Station, 111 Old Federal Building, Columbus 15, Ohio.


*"An excellent introduction to water resources."* —**Journal of Soil and Water Conservation**

**WATER FACTS FOR THE NATION'S FUTURE**

**Walter B. Langbein,** U. S. Geological Survey; and **William G. Hoyt,** formerly U. S. Department of the Interior

**Timely book** offers an authoritative study of federal and state hydrologic programs for collecting, interpreting, and publishing water data. It gives practical recommendations for expansion and improvement; outlines specific steps that must be taken; presents many suggestions for improving the design of hydrologic networks. *A Conservation Foundation Study. 1959. 288 pp.; 41 ills., tables.* **$5.00**

**VEGETATION AND WATERSHED MANAGEMENT**

**E. A. Colman, U. S. Forest Service**

**A systematic appraisal** of the methods of managing vegetation in watershed lands to increase water supplies, check soil erosion and siltation, reduce flood peaks. Book describes how vegetation can be changed to improve the hydrologic processes of interception, infiltration, soil-water drainage and storage, surface runoff, etc. *"A first-class contribution."*—**Journal of Forestry.** *A Conservation Foundation Study. 1953. 412 pp.; 29 ills., maps.* **$8.00**

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**The Flood Control Controversy,** Leopold-Maddock ..... **$ 5.00**
**The Law of Water Allocation in the Eastern United States,** Haber-Bergen **$ 7.50**
**Fresh Water from the Ocean,** Ellis... **$ 6.00**
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**Reproduction of Upland Hardwoods in Southeastern Ohio.** *Robert Merz and Stephen Boyce.* 24 pp., appendix, illus., refs., 1958. Technical Paper Number 155, Central States Forest Experiment Station, 111 Old Federal Building, Columbus 15, Ohio.

**Partial Conversion of Poor Hardwood Stands to Conifers by Planting.** *Leon Minckler and Russell Ryker.* 10 pp., illus., refs., 1959. Technical Paper Number 159, Central States Forest Experiment Station, 111 Old Federal Building, Columbus 15, Ohio.

**The Utilization of Timber Resources in the Watersheds of the State—Final Report of the State Development Committee.** 67 pp., appendix, illus., 1960. State of Victoria, Commonwealth of Australia, Melbourne. (Approximately $0.49.)

**Evaporation and Evaporation Suppression Bibliography.** *Richard D. Reidhead, Jr.* 14 pp., 1960. Water Bulletin Number 6, Department of Resource Development, Michigan State University, East Lansing.

**California Public Outdoor Recreation Plan, Part 1.** 80 pp., color, 1960. Department of Natural Resources, 722 Capitol Avenue, Sacramento, California.

This beautiful publication presents in summary form the findings and recommendations for recreation needs and resources from the viewpoint of statewide interests. It locates the general areas or zones where needs are greatest and indicates the general supply prospects. The sources, public and private, and the levels of government which should have chief responsibility for supply are recommended.

The scope of the plan covers all types of outdoor recreation: sightseeing, travel, picnicking, camping, riding, hiking, swimming, boating, fishing, hunting, and winter activities. This is probably the first comprehensive attempt to plan for meeting statewide recreational needs of the public ever developed.

**Developing a Program for In-service Training in Conservation Education for the Public Schools.** 41 pp., 1960. Conservation Education Association, Eastern Montana College, Billings.

This is the report of the annual conference of the association held in Alpine, Texas, August 1959. From an educator's point of view it contains some excellent suggestions.

**Logging Slash Flammability.** *George R. Fahnestock.* 67 pp., illus., graphs, bibl., 1960. Research Paper Number 58, Intermountain Forest and Range Experiment Station, Ogden, Utah.

**Look to Your Timber America.** 18 pp., color, 1960. Miscellaneous Publication Number 766, Forest Service, U. S. Dept. of Agriculture, Washington 25, D. C.

This new publication provides a "thumbnail" sketch of the timber situation in the U. S. This brief popular edition is a summary of the facts reported in the book "Timber Resources for America's Future."

**Vegetation and Cattle Responses to Different Intensities of Grazing on Short-Grass Ranges on the Central Great Plains.** *G. E. Klipple and David Costello.* 82 pp., illus., 1960. Technical Bulletin Number 1216, USDA, U. S. Government Printing Office, Washington, D. C. $0.30.

**Securing Open Space for Urban America: Conservation Easements.** *William H. Whyte, Jr.* 67 pp., illus. Published by Urban Land Institute, 1200 15th Street N.W., Washington 6, D. C. 1959. $3.00.

A new series of publications has been announced by the International Union for Conservation of Nature and Natural Resources. This new series consists of five volumes compiled from reports given at the Seventh Technical Meeting, Athens, Greece, September 11-19, 1958.

The publications are as follows:

**Volume I—Erosion and Civilizations. Conservation Education. Atomic Hazards.** $3.00.

**Volume II—Soil and Water Conservation***

a. Use of Vegetation in Erosion Control
b. Effects of Dams on Landscape
c. Landscape Management on an Ecological Basis

**Volume III—Soil and Water Conservation***

a. Natural Aquatic Resources

**Volume IV—Soil and Water Conservation.** $5.00.

a. Rates of Run-off and Evaporation

**Volume V—Rare Animals and Plants of the Mediterranean Region.** $2.50.

*In preparation; price not established.

The *Soil Conservation Society of America* is a member of I. U. C. N. and was represented at the Athens meeting by E. H. Graham.

In addition to the publications listed the Union still has available publications from prior technical meetings. Information or purchase of publications may be secured from SCSA, 838 Fifth Ave., Des Moines 14, Iowa, or from International Union for Conservation of Nature and Natural Resources, 31 Rue Vautier, Brussels, Belgium.

**Things to Do . . . In Science and Conservation.** *Byron Ashbaugh and Muriel Beuschlein.* 163 pp., illus., refs., 1960. Interstate Printers and Publishers, Inc., Danville, Illinois. $2.50.

Here is a new book that covers the broad fields of natural resources and conservation in a manner suited to educational techniques and objectives of teachers at various levels. It will help provide some simple and effective tools for all teachers.

Background information introduces each topic and this is followed by suggested demonstrations, projects and questions to be answered.

**Proceedings of the Sprinkler Irrigation Industry Open Conference.** 102 pp., legal size, 1960. Sprinkler Irrigation Association, P. O. Box 455, Los Gatos, California.

# Notes from the Field

## Taking the Bite Out of Small Streams in Texas

A MAJOR PROBLEM often encountered, as farmers and ranchers are assisted through their local soil conservation districts by Soil Conservation Service personnel with the application of a conservation farm plan, is the disposal of excess water. All the water is not absorbed by the soil during rainstorms which exceed 3 inches of precipitation with an intensity exceeding 1 inch an hour. Nor can the soil absorb precipitation of greater volumes even if they do occur over somewhat longer periods. Thus, to prevent damaging erosion, provision must be made for safe disposal of the surplus runoff.

In addition to the water disposal system, other supporting conservation practices are used to retard soil erosion. The practices include: terracing, contour farming, cover crops, conservation cropping systems and crop residue management.

Cooperators find it is necessary to establish a good cover of grasses on an area before surplus water can be concentrated and released without damage. These areas, eastablished with grass cover, are called waterways. The grass cover is sometimes cut for hay or grazed, providing additional use other than just the safe disposal of surface runoff.

In Texas, the northern part of the Blackland resource area has deep, well defined natural watercourses. Very often the waterways must empty into these deep creeks that have vertical banks. To release the water from a waterway into one of these creeks would cause serious erosion in Houston clay or Houston Black clay soils (figure 1) unless some form of a stabilization measure is used to prevent damage.

Various types of stabilizing measures have been used in the past. Some have failed for one reason or another. In general, there are four types that have proven satisfactory with an average amount of low-cost maintenance work (2). The selection and use of a particular measure is based on conditions that exist at the structure site.

Grassed waterways discharging directly into natural watercourses usually have a short section on the outfall end that is constructed on a steep grade such as a 15 to 1 slope. These grassed waterways are established to sod forming bermudagrass (figure 2).

Where the soil is deep or topsoil will be spread over the sloped area, a good cover of sod grasses can be grown. The most common grasses used are common or Coastal bermudagrass. A semi-prostrate grass less frequently used is KR bluestem. Trees and all tall-growing vegetation must be removed and regrowth controlled.

Where rock has been exposed in the bottom of a creek, it is impossible to maintain sufficient depth of soil on the rock to grow grass. A high-runoff-producing storm often washes the soil and grass off the rock, eventually starting a new gully. To stabilize grassed waterways where rock is exposed at the lower end, it is necessary to build a reinforced concrete wall to a height of 1 foot or more. This wall should be bonded to the rock. Figure 3 shows a farm pond vegetated spillway with a one-foot high reinforced concrete wall that was constructed in 1948. This spillway has safely conveyed repeated discharges of storm runoff water for a period of eight years without apparent damage.

A very popular stabilizing measure is the low head drop inlet structure (3). This structure is used to reduce erosion hazards in a natural drainageway and stabilize an overfall that, if not controlled, would continue to move up the slope with every runoff-producing rain.

The structure may consist of a treated corrugated metal pipe placed horizontally through an earth fill or dam, with a riser or vertical pipe approximately 12 inches larger in diameter than the pipe through the fill.

The low head drop inlet is designed to handle the runoff from the average rains that occur. At one end of the earth fill over the drop inlet pipe an emergency vegetated spillway is constructed. This

*SCS Photo by Yoder*

*SCS Photo by Faulk*

**Figure 1. (below) Severly eroded gully down center of bermudagrass waterway.**

**Figure 2. (right) Sod chute flowing after a 6 inch rain over a three day period. A diversion terrace empties 40 acres of runoff onto this waterway. Chute has a 20 foot flat bottom.**

**Figure 3. (lower right) Stabilizing measure at outlet end of a farm pond spillway that has a series of thick limestone rock ledges at the point of water release.**

*SCS Photo by Brown*

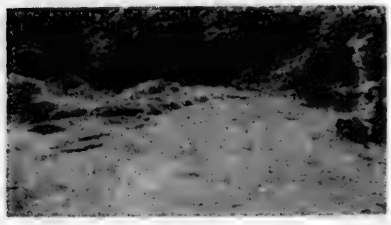
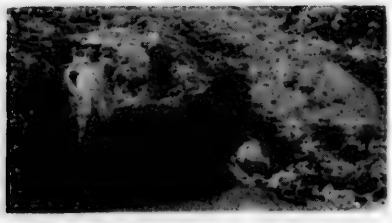


**Figure 4. (top) A view of one of two 66 inch diameter pipe drop inlets receiving storm runoff.**

**Figure 5. Water leaving the two 48 inch corrugated metal pipes of this drop inlet structure. One inlet is shown in figure 4. Difference in water surface level on the other side of the dam and the top of the outlet pipe is 16 feet.**



**Figures 6 and 7. After a 5-inch rain that fell in one hour's time, the drop inlet stabilizing measure shows no evidence of damage.**

emergency spillway is designed to handle the excess flow from large, infrequent rains which produce runoff in excess of that which the drop inlet is designed to carry.

Figure 4 shows a typical on-the-farm corrugated metal pipe drop inlet stabilizing measure taking the bite out of a small stream that carries storm runoff water from 860 acres.

After the 5-inch rain that fell in 1 hour's time was over, the drop inlet stabilizing measure shows no evidence of damage.

This type of structure is usually located on the farm or ranch; however, it is becoming very popular with county commissioners where a bridge or culvert is needed in a county road. In such instances the benefiting landowner usually pays for part of its cost. The Texas Highway Department standards of drainage structure designs and specifications make use of structures similar to that shown in Figure 8, which was constructed in a gully crossed by a state highway farm road near Gunter. This structure reduces 7 feet of excess grade.

Some of the other practices used on this watershed are terraces that carry runoff water away from the highway right-of-way to a grassed waterway, conservation cropping system, cover crops and crop residue management.

REFERENCES

1. Soil Conservation Service Engineering Handbook, Section 4, "Hydrology"; Section 5, "Hydraulics"; Section 6, "Structural Design"; and Section 11, "Drop Spillways."
2. Texas Engineering Handbook for Work Unit Staffs, Section 5, "Waterways"; and Section 12, "Gully Treatment."
3. Texas Conservation Practice Specifications TX-10, "Pipe Drops and Similar Structures."

NATHAN M. FAULK *is field specialist in engineering with the Soil Conservation Service at Forth Worth, Texas.*

*SCS Photo by Brown*

**Figure 8. Reinforced concrete riser attached to concrete pipe culvert under a farm road by the Texas Highway Department. Culvert diameter is 54 inches and the four openings under the protective cover are each 60 x 20 inches.**

## ESSENTIALS FOR TEACHING CONSERVATION AND RESOURCE USE

"HOW DO YOU SATISFY unlimited wants with limited resources?" This is one of the most crucial questions facing the world today. In our form of economy and government, where so much depends on individual decisions, we must educate everyone in the principles and practices of sound allocation of resources if we are to achieve the standard of living we seek and of which we are inherently capable.

The tasks faced on the world scale are increasingly acute because of the exploding world population, the industrialization of underdeveloped countries and the drain on resources from war and the threat of war. Making decisions about resources is becoming increasingly complex and we need to train students to become aware of the many factors contributing to this complexity. Consideration must be given to the impact of accelerating science, increasing leisure, expanding world trade, newly developed land areas, and air and water pollution.

Conservation is a "natural" for teaching, at all levels. There is an immediacy and a self interest about the subject, as well as abundant teaching material. First-hand laboratories and problem situations are easily available no farther away than the school grounds. Conservation can be correlated with all subjects in the curriculum. In addition, it offers problem solving and action-taking experiences.

In determining the focus of conservation education for students, it is important for teachers to consider various levels of competence which students are likely to need for future responsibilities. Education should be attuned to the appropriate levels. Such levels of competence are:

**1** A general understanding of resources and their inter-relationships.

**2** Intensive understanding of particular resources.

**3** Technical competence in dealing with resources.

**4** Policy making concerning resources.

The teaching of conservation might be approached in several different ways:

- Start with the physical sciences and add social science dimensions.
- Start with the social sciences and add physical science dimensions.
- Use the "problem" approach, bringing to bear appropriate knowledge from all subjects. The broad problem area might be organized with these sub-problems:

How important are resources to our way of life?
How urgent is the situation?
What are the chief considerations and issues?
What are the opportunities for action?

While conservation education is effective when it focuses upon the personal and local level, the understanding of students should be broadened to encompass state, regional, national and world resources. A world viewpoint is needed for considering the needs and contributions of all people in making the best use of resources.

How does conservation fit into the various subject matter areas? Here are some examples:

▸ In *history* and *anthropology* one can trace the influence of resources on ways of life, on values, on the kinds of government, the movements of people, and the rise and fall of civilization.

▸ In *economics*, one might stress the relationship of needs to the resource base, the choices to be made as to immediate versus future use, how the use of human resources is influenced by natural resource policies, how to use our capital resources. Then there might be discussion of the scientific, economic, cultural and legal limitations imposed on resource-use. Thought might be given to the activities to be carried out in resource development (location, extraction, processing, production, distribution, pricing). Finally, there might be discussions of the systems under which various peoples deal with their resources—market-centered, socialistic, or mixed economies.

▸ In *political science*, one might include the methods of stimulating or controlling resource development and use, the ways of channeling people to meet new resource needs, and the levels of government involved in resource problems.

▸ In *sociology*, the emphasis might be on population growth, location and composition of population, and the significance of these factors in regard to resource-use.

▸ *Science* and *geography* might concern themselves not only with physical identification of renewable, exhaustible, and energy resources, but also with their economic characteristics and significance. Emphasis would be given to the interdependence of natural resources as well as to the effects and potentials of human interaction with these resources. The potentialities for increasing supply by discovery of new sources, new technological developments, new materials, and new applications of resources, can be explored.

Good teaching in conservation, regardless of subject area, should give students practice in the ways of research and give them experience in critical, analytical and dynamic thinking. Students should become aware of their responsibilities as consumers, citizens, future technicians, producers and policy-makers. The assumption of responsibility and the taking of appropriate action should be the outcomes of successful teaching.

For this task all teachers are needed at every grade level. In-service courses are necessary to give practicing teachers the necessary content and perspective, thus enabling them to add new dimensions to their teaching. Scope and sequence plans need to be worked out to insure comprehensive coverage at appropriate places and to make certain that things are not simply left to chance.

Exchanges of ideas between teachers and community advisory groups in addition to an on-going study council will reinforce teachers and give them the necessary support for their urgent and challenging job.

---

*Dr. George L. Fersh is director of the Conservation and Resource-use Education Project of the Joint Council on Economic Education. This paper is a summary of the keynote address presented at the annual Conservation Education Association Conference held August 17-19, 1959, at Alpine, Texas.*

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# FLOATING TRASHBAR FOR V-NOTCH WEIRS

CLARK H. GLEASON

Floating leaves, sticks, and other debris lodged in the V-notch weir of a streamgaging station make trouble for watershed researchers who want an accurate record of the flow of small streams. The trouble is worst at stages below 0.75 feet, when the flow is shallow; at higher stages the weir tends to be self-cleaning. During periods of low flow some sort of trashrack is usually needed to keep the V-notch clear.

Trashracks of wire mesh or metal bars have been used widely, but they require frequent cleaning at times of heavy leaffall. Moreover, they must be removed at high stages when they might interfere with the flow and alter the hydraulic characteristics of the weir. Manual removal is usually impractical at remote sites, while automatic removal is likely to require intricate and costly equipment.

This note describes a simple, floating trashbar that keeps debris away from the V-notch at low flows, and removes itself when the pond rises to a preselected stage. The device is easily made, installed, and serviced by one man, and its cost is low.

The trashbar is a modified 2-inch irrigation siphon closed at both ends so that it will float on the weir pond. Straight aluminum tubing could be used, but the siphon comes already bent. The bar is anchored at its ends by eye-bolts that slide on vertical rods as the water surface of the pond rises and falls. The rods may be attached either to the weir blade (figure 1) or to the face of the control structure. A shaft collar on each rod is set to stop the eye-bolts at any desired height on a rising stage, and hold the tube ends under water. As the ends submerge, water reaches intake holes drilled in the top of the tube; the trashbar fills with water and sinks in less than one minute as entrapped air escapes through an exhaust hole at the bend in the tube. Having sunk, the bar settles to the ends of the vertical rods, well below the V-notch (figure 2), where it is held by other shaft collars. The trashbar is reset by lifting it and draining out the water.

An anti-freezing hood used in winter, described by Johannessen (1), may be left on in summer to help keep leaves from falling into the open water between the weir and the trashbar.

Construction details of the trashbar are shown in figure 3. The tube ends are flattened and bent in a vise, using care to avoid fracturing the aluminum. Sealing the tube ends is not necessary if careful work is done, as they ride above the water.

Each vertical rod is anchored by passing it through a 3/16 x 3/8 inch eye-bolt attached to the weir blade or to expansion plugs set in the face of the dam. Three shaft collars are required for each rod: One at the top to suspend the assembly, one that can be adjusted to sink the trashbar at the desired stage, and one at the bottom to hold the trashbar on the rod when the bar is sunk (figure 2).

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*Clark H. Gleason is forester, Snow Hydrology Studies, Pacific Southwest Forest and Range Experiment Station, Forest Service, U. S. Dept. of Agriculture, with headquarters at Berkeley, California.*

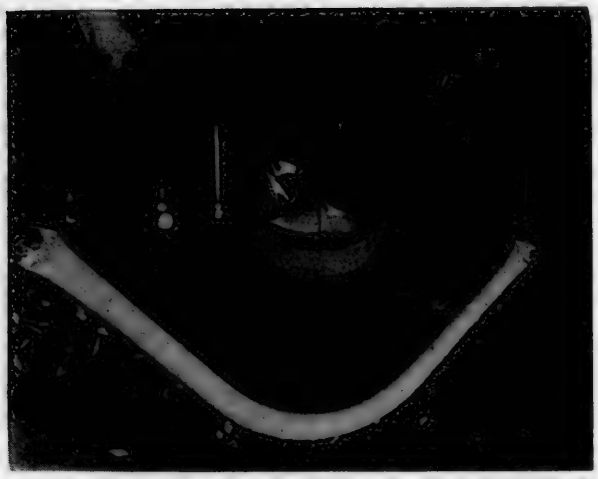


**Figure 1. Trashbar floating on pond at weir keeps debris away from V-notch. The two horizontal studs support an anti-freezing hood in winter.**

**Figure 2. Bar remains submerged in winter and during periods of high streamflow; it is held on guide rods by shift collar at bottom ends.**

Materials and their approximate cost for one installation are as follows:

| | |
|---|---|
| 1 Siphon tube, aluminum, 2 x 60 inches ..... (With 120 degree V-notch use 2 x 90 in. siphon costing $1.90) | $1.20 |
| 2 Eye-bolts, ¼ x 2 in., with eye ⅝ to ¾ in. I.D., each with 2 nuts, non-rusting ..... | .20 |
| 2 Eye-bolts, 3/16 x 2 in., with eye ⅜ in. I.D. with nuts .. | .10 |
| 2 Expansion plugs, or tamp-ins, 3/16 in., for mounting on masonry or concrete ..... | .30 |
| 2 Rods, aluminum, round, ⅜ in. x 3 ft. ..... | 1.40 |
| 6 Collars, shaft, non-rusting, ⅜ in. ..... | 1.50 |
| 6 Set-screws, non-rusting for collars ..... | .30 |
| | $5.00 |

A star drill and tamp-in setting tool will be needed if the guide rods are to be mounted on masonry or concrete. Bottom ends of the vertical rods need not be attached to the control structure.

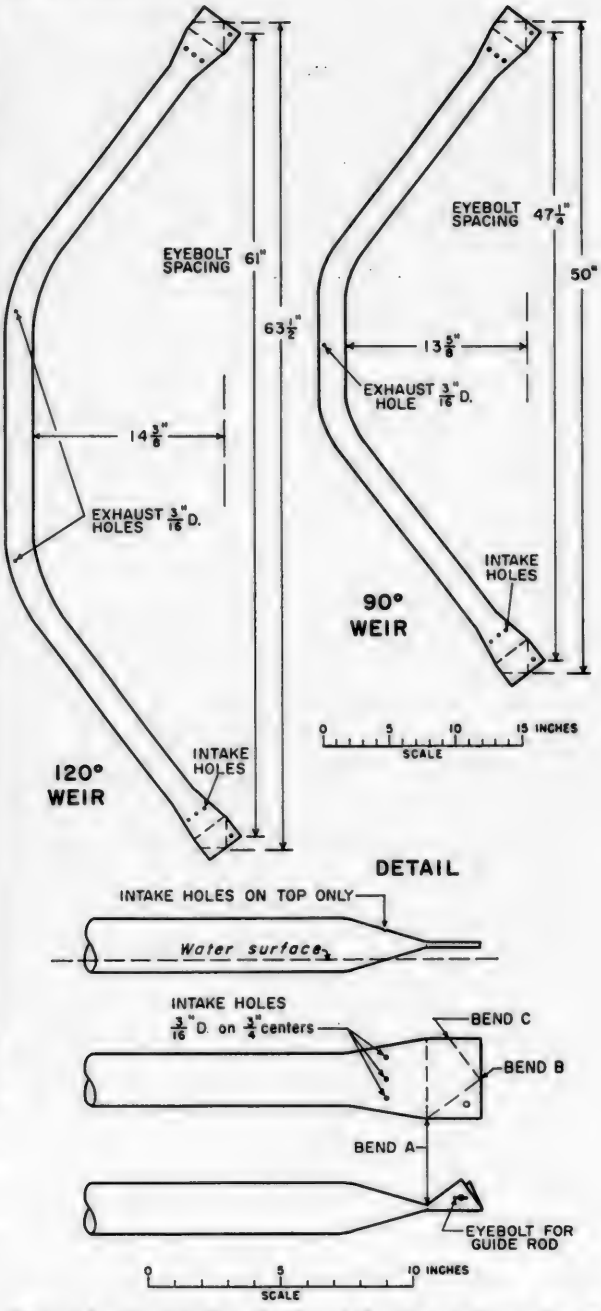



**Figure 3. Construction details of floating trashbars for 90 and 120 degree V-notch weirs.**

Installations of this kind have served satisfactorily the past 2 years at 10 gaging stations at a 6,000 foot altitude in the Sierra Nevada Mountains of California. The trashbars are kept floating during the low flows of summer and fall, and they are left submerged during the winter and spring. A wet, heavy snow or a freshet from a summer thunderstorm will sink them, requiring resetting.

## REFERENCES CITED

(1) Johannessen, C. L. 1957. *Anti-freezing hoods for V-notch weirs.* Jour. Forestry 55(8): 590.

# The Society in Action!

"Land Use in a Changing Agriculture" will be the theme of the 16th Annual Meeting of the *Soil Conservation Society of America.* New and added features will be included in the program scheduled at the facilities of Purdue University, Lafayette, Indiana, July 30-August 2.

The Annual Meeting Program Committee, under the direction of Frank H. Mendell, chairman, is planning major presentations on the main theme with several shorter papers to be delivered in discussion groups that will run simultaneously. For the first time the *Society* is undertaking a plan to provide for more presentations on specific topics directly and indirectly related to the main theme. It is now planned to divide into four groups for a symposium type of presentation with ample time for discussions.

The four sections will be Soil, Water, Plants, and Animals. Present plans call for two and possibly three of these smaller group sessions. The topics and presentations will be about twenty minutes in length and pitched to a particular point. For example, in one of the symposiums on water, the subjects could be "Land Use Adjustment in Watershed Development," "Forestry Needs in Watershed Work," "Engineering Design of Major Watershed Structures." In the second symposium on water, the subjects could include recreation, wildlife, and economics of watershed protection. These four groups lend themselves to a wide variety of presentations and represent all interests of *Society* members.

Other features of the program will include committee reports and recommendations which are an important part of the annual meeting, presentation of awards, the president's annual message, and entertainment. The Indiana Chapter and the Local Arrangements Committee are planning for a barbecue, tours to points of interest, and additional entertainment.

An important point with regard to the *Society's* annual meeting is that sessions are planned for the ladies. These will deal with general phases of conservation and will include several strictly ladies' tours and activities. Many *Society* members will bring their entire families to this meeting.

**Plan now to attend the Society's 16th Annual Meeting at Purdue University, July 30-Aug. 2**

## Important Dates

Since the 1961 *SCSA* annual meeting will be held nearly a month earlier this year than in the past, the deadline dates for *Society* elections and awards nominations have been moved forward.

**Nominations** are now being accepted for all *Society* officer and three Council positions. Council members serve a 3 year term while officers serve for 1 year.

One council member-at-large position is open and nominations for this office may be made without regard to geographic location. The Canadian Region will nominate and elect one individual to serve on the Council, and the Western Region (consisting of Hawaii, Alaska, California, Oregon, Washington, Idaho, Utah, Nevada and Arizona) will nominate and elect a Council member to represent the Region. Present incumbents respectively in these Council positions are Harold M. Rhodes, N. R. Richards and Herbert A. Hopper.

Nominations should be submitted to John W. Barnard, chairman of the Nominations Committee, 4306 Underwood Street, University Park, Maryland. They must be in his hands prior to April 1, 1961.

Complete information concerning nominations is contained in the Bylaws which are available from the *Society* office or from any Chapter chairman.

**Fellow and Honorary Member** nominations should be sent to the Executive Secretary of *SCSA,* 838 Fifth Avenue, Des Moines 14, Iowa, and must reach him not later than May 1, 1961. Full information for determining qualifications for these awards is available from Chapter officers or the *Society* headquarters. Mr. J. C. Dykes, Soil Conservation Service, South Agriculture Building, Washington 25, D. C. is chairman of the Fellows and Honorary Members Committee.

**Commendation and Merit Award** nominations must be submitted to Herbert A. Hopper, chairman of the Awards Committee, 975 Hawthorne Drive, Lafayette, California, prior to May 1, 1961. Complete information regarding these awards made to individuals and groups can be obtained from the committee chairman.

**Chapter Activities Contest** entries must be in the hands of the Chapter Activities Committee chairman, I. O. Hembre, Room 1, Soils Building, College of Agriculture, Madison 6, Wisconsin, prior to May 31, 1961. There are two divisions in this contest. For chapters with comprehensive total programs the total program may be entered, or a chapter may prefer to enter a single outstanding activity in the appropriate division.

**Outstanding Journal Article** nominations may be made by any *Society* member. Awards are given only for original unpublished JOURNAL OF SOIL AND WATER CONSERVATION articles that make a solid contribution to the science and art of good land use.

Articles appearing in the JOURNAL after July 1, 1958, are eligible for consideration. Every *SCSA* member is encouraged to submit his suggestion prior to May 1, 1961, to Ben O. Osborn, chairman of the Editorial Board, Soil Conservation Service, South Agriculture Building, Washington 25, D. C.

## COMMITTEE FOR 1962 SCSA MEETING ORGANIZED

DELEGATES of Northeast Chapters meeting in Washington, D. C., on February 25 named William Berry, past-chairman of the Washington, D. C. Chapter, as general chairman of the Steering Committee for the 1962 annual meeting to be held in Washington, D. C.

Other members of the Steering Committee from their respective chapters include: Harper Simms, C. R. Henry, and William Pate of the Washington, D. C., Chapter; T. W. Edminster, Charles Logan, and C. S. Britt of the Old Line Chapter; Frank Edminster, A. H. Anderson, and Bill Cooper of the Virginia Chapter; and Robert Hanna of the New Jersey Chapter.

Others will probably be named from the Northeast as the time for the meeting approaches.

## ASAW TO MEET

The Association of Southern Agricultural Workers will meet February 6-8 at Jackson, Mississippi. *SCSA* has agreed to cooperate in the sponsorship of the Soil Conservation Section of that meeting. This section will meet in the Walthall Hotel in Jackson.

Under the chairmanship of John H. Cockerham the Soil Conservation Section has planned a well-rounded program of concern to all persons interested in the conservation of soil and water.

Dr. Elmer Sauer, past president of *SCSA,* will deliver an address during the second day of the meeting.

## 1961 Society Committees and Chairmen

**Annual Meeting Local Arrangements**—Harry M. Galloway, 479 Robinson, W. Lafayette, Indiana.

**Annual Meeting Program**—Frank H. Mendell, 405 Iowa Building, Des Moines 9, Iowa.

**Archives**—T. L. Gaston, 4700 Connecticut Avenue, N.W., Washington 3, D. C.

**Awards**—Herbert A. Hopper, 975 Hawthorne Drive, Lafayette, California.

**Booklet Sales**—Jack L. Barrick, 20 Victoria Drive, South Burlington, Vermont.

**Building Fund**—Harold M. Rhodes, Route No. 3, Morgantown, West Virginia.

**Chapter Activities**—I. O. Hembre, Room 1, Soils Building, College of Agriculture, Madison 6, Wisconsin.

**Editorial Board**—Ben O. Osborn, Soil Conservation Service, South Agriculture Building, Washington 25, D. C.

**Elections**—R. A. Wilcox, 405 Iowa Building, Des Moines 9, Iowa.

**Fellows and Honorary Members**—J .C. Dykes, Soil Conservation Service, South Agriculture Building, Washington 25, D. C.

**Finance**—Minott Silliman, Jr., 929 S. Myrtle Street, Kankakee, Illinois.

**Housing** (Headquarters Building)—Frank H. Mendell, 405 Iowa Building, Des Moines 9, Iowa.

**International Relations**—Warren T. Murphy, U. S. Forest Service, South Agriculture Building, Washington 25, D. C.

**Land Utilization**—Frank W. Schaller, 131 Agronomy Department, Iowa State College, Ames, Iowa.

**Membership**—William M. Briggs, 1525 Cason Street, Lafayette, Indiana.

**Nominations**—John W. Barnard, 4306 Underwood Street, University Park, Maryland.

**SCSA Office Procedures**—Carl H. Dorney, Soil Conservation Service, South Agriculture Building, Washington 25, D. C.

**Organization and Policy**—W. W. Pate, 10113 Riggs Road, Adelphi, Maryland.

**Professional Training**—W. J. Huddleston, Box 87-A, Tennessee Polytechnic Institute, Cookville, Tennessee.

**Program Development**—Roy D. Hockensmith, Soil Conservation Service, South Agriculture Building, Washington 25, D. C.

**Public Policy**—George M. Browning, Agricultural Experiment Station, Ames, Iowa.

**Spanish Glossary**—William A. Gracia, 1409 Ponce de Leon Avenue, Santurce, Puerto Rico.

**Special Publications**—D. Harper Simms, Soil Conservation Service, South Agriculture Building, Washington 25, D. C.

**Student Chapters**—Robert M. Hanna, College of Agriculture, Rutgers University, New Brunswick, New Jersey.

**Water Resources Management**—Marshall W. Qualls, Department of Conservation, New Capitol Annex, Frankfort, Kentucky.

The *Society* will be officially represented in the following organizations by the individual named.

**American Association for Advancement of Science**—Donald A. Williams, Soil Conservation Service, South Agriculture Building, Washington 25, D. C.

**American Grassland Council**—B. D. Blakely, Soil Conservation Service, South Agriculture Building, Washington 25, D. C.

**International Union for Conservation**—Edward H. Graham, Soil Conservation Service, South Agriculture Building, Washington 25, D. C.

**National Watershed Congress**—Alvin C. Watson, 7600 West Chester Pike, Upper Darby, Pennsylvania.

**Natural Resources Council**—Edward H. Graham, Soil Conservation Service, South Agriculture Building, Washington 25, D. C.

**Policy Committee for Scientific Agricultural Societies** (Scientific Manpower Commission) — John W. Barnard, 4306 Underwood Street, University Park, Hyattsville, Maryland.

**Soil Conservation Section, Southern Association of Agricultural Workers**—John Cockerham, Box 827, Alexandria, Louisiana.

**West Virginia Chapter** of *SCSA* teamed up with the Christmas Tree Growers Association and added to their highly successful grass and legume plots at the West Virginia State Fair, Lewisburg, West Virginia a living exhibit of Christmas trees. The tree exhibit is in two parts. One part features specimen size trees of various kinds normally grown for Christmas trees in West Virginia. It shows what various species, properly sheared and managed, look like at harvest time. The other part of the tree exhibit shows seven Scotch pines ranging from 1 year through 7 years growth. These Scotch pines give growers an idea how the trees should look at the various ages when properly sheared.

The Christmas Tree Growers Association furnished the trees balled and burlaped and delivered to the site. Chapter members planted the trees and provided their subsequent care. The trees will be suitable for exhibit for three years, and at that time the necessary replacements will be made.

This use of living plant materials for exhibit purpose at the State Fair has been well received by both fair officials and the public. Over a quarter of a million people visited the State Fair this year and from the looks of the pathways, practically all of them visited the plots sometime during the Fair.

The grass-legume plots were first exhibited at the fair 3 years ago and since then have been the subject of considerable comment and discussion. Everyone likes the idea and the chapter makes special effort to keep these plots in good shape.

The West Virginia Fair recently produced a fifteen-minute color movie of the fair activities for promotional purposes.

**The row of trees to the right features specimen size trees of various species adapted in West Virginia. The row on the left features Scotch pines ranging in age from 1 to 7 years. A well designed sign on the left indicates that the Christmas tree exhibit as well as the grass-legume exhibit are West Virginia Chapter projects in cooperation with other groups.**

*SCS Photo by Wickline*

## International Relations

"You may talk about international financial aid, about alliances and top level negotiations, but for our money," continues an editorial in the Daily Belle Fourche Post, South Dakota, "we have just finished shaking hands with a man who represents the greatest contribution to improved international relations that man has yet conceived."

The editorial refers to Edward Mendago of La Paz, Bolivia. He is one of the hundreds that each year come to the United States as a trainee in the program that is jointly sponsored by the International Cooperation Administration of the U. S. State Department and cooperating agencies in the U. S. Department of Agriculture.

Those of us who have an opportunity to see some of these young men when they come to our shores, and again when they leave for home, find it easy to share the enthusiasm expressed by the editor in South Dakota.

I shall never forget a boy who came to us from Australia. With eyes blazing and with intense interest, he told me about what he had learned about soil conservation districts. He understood clearly how these farmer-organized, farmer-operated, and farmer-controlled instruments of government were created by local people. It is a story familiar to all of us—a groundline democratic process in action—yet, here was a boy from the far side of the world who had picked up a precise lesson that we would be happy to have known by people everywhere.

These boys are coming to the U. S. annually by the hundreds. You see them on tractors building terraces, with soil surveyors mapping soils for basic information, laying out contour lines for strip cropping of fields, at work on irrigated farms, measuring timber in the deep forests of Oregon, probing for facts at our 50 or more experiment stations, attending meetings with Extension workers and learning how the adult education process is conducted among American farmers.

From Brazil come these comments in a U. S. Overseas Mission report: "With the historic concept of exploitation of the natural resources prevailing, the development of a unified conservation program has been difficult. Much of the land presently conquered has long since been exploited, making the first job at hand one of reclamation. Yet, steady progress has been realized. A conservation district demonstration was undertaken in Rio Grande do Sul in 1955. This resulted in the organization of a State Soil Conservation Service by the Secretary of Agriculture. In 1959, there were eight district teams training in mapping and planning farms and designing appropriate conservation measures. The local teams assisted nearly 100 farmers in establishing complete conservation programs."

Since the program began in 1942, approximately 2,900 trainees from other countries have sought information and help from the Soil Conservation Service. During 1960 the Soil Conservation Service gave training and assistance to 334 people from 60 foreign countries, and the Agricultural Research Service provided training and assistance to 149 individuals interested in the research aspects of soil and water conservation. The Federal Extension Service reports 109 participants in this field during the last two years and currently 20 are being given assistance by the Forest Service.

Many who have seen this program in operation over the years are convinced that follow-up procedures are either entirely lacking or are grossly inadequate. Each year these boys come to us; each year they leave. What do they go back to? What are their opportunities when they get back home? It is true that many of them get the JOURNAL; it is true that many of them are corresponding with technicians in this country; it is true that bulletins and other materials are being sent to them. All of this is being done, but the effort thus far is inadequate.

### A Proposal

It seems to me that this whole problem is worthy of debate and discussion in *SCSA* chapter meetings throughout the land. Most chapter members have had contact with our foreign visitors and many will have helpful ideas. We need those ideas. I suggest that if you have a discussion of this problem in your chapter that you send the results to the JOURNAL. Perhaps out of discussion and debate the *Society* can find a meaningful way to maintain contact with these young men who carry so large a responsibility in the future of their own lands.

The eagerness and zeal displayed by some of these men suggest that one need not be surprised to learn that some country, some day, might have in its midst a crusader in the image of Gifford Pinchot, Hugh Bennett, or M. L. Wilson.

*Glenn K. Rule was chairman in 1960 of the Soil Conservation Society of America's International Relations Committee.*

## Sustaining Members in SCSA

The *Soil Conservation Society of America,* with an active membership of more than 10,000 people, includes a great many persons who spend all their working hours out in the field dealing personally with those who gain their livelihood directly by and on the land.

The *Society's* members are particularly concerned with the conservation of all our renewable natural resources—soil, water, crops, grasslands, livestock, forests, fish, wildlife, and recreational areas—for improved use in perpetuity. They exert a great deal of influence in this connection, both directly and by way of the soil conservation district supervisors and similar groups. No other organized group of people is closer to the land and to those who make their living from it than the membership of the *Soil Conservation Society.*

The *Society* is trying to render public service much beyond its capacity to finance it by membership fees and by the production and sale of educational booklets. For example, it has outlined, in considerable detail, 10 projects that impress its membership as having particular merit for support on the part of all those concerned with the conservation problem. These include scholarships, graduate fellowships, Hugh Hammond Bennett fieldwork fellowships, research fellowships, special reports, special awards, free copies of the *Society's* JOURNAL for special purposes, travel funds for representatives to international meetings on conservation, a modern headquarters building for the *Society,* and increasing the number of issues of the *Society's* JOURNAL OF SOIL AND WATER CONSERVATION.

The last two of these projects—the building and the JOURNAL—are being financed mostly by extra contributions by the members themselves. Thus each member is being asked to contribute $10 toward the building fund and the cost of the extra issues of the JOURNAL will be covered by raising the annual dues from $5 to $7.50 per year, beginning with the 1961 dues.

But large additional funds will be required to activate the remaining projects. Accordingly, a special type of sustaining membership is being sponsored, the cost of which is $27.50 per year for an individual and $100 per year for a company, institute, foundation or other agency. The extent to which these sustaining memberships are now being supported is indicated in the two lists that follow.

—FIRMAN E. BEAR, *Chairman*
Development Fund Board

## Individual Sustaining Members

Albosta, Paul
Allison, Gordon E.
Anderson, M. S.
Austin, Wayne W.
Ayers, Thomas L.

Bailey, R. Y.
Ballantyne, Chas. R.
Barnard, John W.
Barrows, Howard F.
Bear, Firman E.
Benitt, William A.
Berry, William H.
Bobst, H. G.
Bolton, E. D.
Bone, Harold R.
Boyle, Robert V.
Britt, Clarence S.
Brown, Carl B.
Browning, G. M.
Bruns, Herbert E.
Bullard, Richard
Burkhalter, Harvey D.

Chambers, Harry M.
Colburn, William
Cole, Thomas
Colgan, Joe M.
Crawford, C. P.
Crocker, Edwin G.
Cutchin, J. M.

Daniel, Harley A.
Davis, David O.
Davis, Russell B.
Davison, Verne E.
Deibert, Olin
Dobkin, R. M.
Douglas, Ruth T.
Dykes, J. C.

Edminster, Frank
Evans, Frank

Flory, Evan L.
Fox, Adrian C.
Freking, F. W.

Garman, W. H.
Gaston, T. L.
Geertsema, G. L.
Gladhill, B. D.
Goethe, C. M.
Graff, Roy L.
Graham, Edward H.
Green, Everett C.
Green, T. C.
Griffin, Fair C.
Groover, John T., Jr.
Gumbel, Mrs. W. C.
Gumbel, Walter C.

Haischer, Carl E.
Harrison, Phoebe O.
Heinen, Raymond W.
Henry, C. R.
Hewitt, Douglas
Hill, Russell G.
Hockensmith, Roy D.
Hopkins, B. H.
Hopkins, Frank J.
Hopper, Herbert A.
Hunt, W. A.

Irving, R. N.

Jentsch, Frederick P.
Jeske, Walter E.
Jeske, Mrs. W. E.
Johndreau, C. N.
Jordan, J. E.

Kelly, Irwin J.
Kirk, M. D.
Koller, J. Harry
Kuykendall, J. P.

Lamb, John, Jr.
Lambert, Mrs. G. B.
Latimer, William J.
Lough, L. L.
Luker, Cyril
Lyman, Robert A.

McCuen, John E.
McGill, R. B.
McGrew, Paul C.
Mann, W. H.
Mason, Jr., Geo. C.
Mark, Wayne C.
Meade, I. J.
Mendell, Frank H.
Mitchell, Lyall
Moen, Alan J.
Mohagen, Verna C.
Money, W. J.
Montgomery, L. E.
Moore, W. R.
Murdock, L. W.

Neubauer, T. A.
Nixon, Walton M.

Owen, E. A.

Pate, W. W.
Paulson, Lincoln
Patrick, Austin L.
Perry, Esther P.
Peterson, W. J.
Phillips, George R.
Plambeck, Herb
Pozarnsky, Thomas
Prange, Fred W.
Pray, H. L.
Pritchard, H. Wayne
Pulling, Harold M.

Rand, J. E.
Rettie, James C.
Rhodes, Harold M.
Richards, N. R.
Ritchie, Fred L.
Rockie, W. A.
Rule, Glen K.
Russell, J. S. (deceased)
Ryerson, G. E.

Sacco, D. Joseph
Santon, Alvin F.
Sauer, Elmer L.
Saxton, Alvan F.
Schaller, Frank
Shade, Earl R.
Silliman, Minott, Jr.
Simms, D. Harper
Sockman, Hobart S.
Stafford, I. B.
Starr, Jr., Claude S.
Stoesz, A. D.
Strathearn, Dave
Studor, Ward
Summers, Felix

Thorfinnson, M. A.
Thorpe, Gus A.
Tower, Harold E.
Tyler, Lloyd E.

Van Ness, Glen B.
Veazey, A. H.
Vessey, J. K.

Waldrop, Hazell E.
Walker, Ernest D.
Wallace, James W.
Warrick, Clarence W.
Watson, Alvin C.
Weiss, Walter
West Pottawattamie Co. S. C. D.
Whitenack, David S.
Whitsitt, R. F.
Williams, Donald A.
Williams, Lewis D.
Wilson, Robert S.
Winchester, Geo. L.
Wright, Harry R.

Young, L. H.

## Industrial Sustaining Members

Allis-Chalmers Manufacturing Company.....*Milwaukee, Wis.*
Amchem Products, Inc. .....*Amber, Pa.*
American Petroleum Institute .....*New York, N. Y.*
Bowerston Shale Co. .....*Bowerston, Ohio*
Caterpillar Tractor Co. .....*Peoria, Ill.*
Carolina Power and Light Co. .....*Raleigh, N. C.*
Deere and Company .....*Moline, Ill.*
Farm Equipment Institute .....*Chicago, Ill.*
Gehl Bros. Manufacturing Co. .....*West Bend, Wis.*
Hampton Road Tractor and Equipment Co. .....*Norfolk, Va.*
Hoover Equipment Co. .....*Oklahoma City, Okla.*
International Harvester Co. .....*Chicago, Ill.*
Majenica Tile Co. .....*Huntington, Ind.*
Massey-Ferguson Co. .....*Racine, Wis.*
Oliver Corporation, The .....*Chicago, Ill.*
Popper Co., Wm. C. .....*New York, N. Y.*
Royster Guano Co., F. S. .....*Norfolk, Va.*
Rush Creek Clay Co. .....*Junction City, Ohio*
Schield-Bantam Co. .....*Waverly, Iowa*
Southern States Cooperative, Inc. .....*Richmond, Va.*
Thomas Jefferson Soil Conservation Dist. ....*Charlottesville, Va.*
Trust Company of Georgia .....*Atlanta, Ga.*

## Building Fund

Building fund pledges totaling $41,495 from 25 Chapters had been received on January 1, 1961. The detailed report on the facing page will show that many chapters are on the move. Examine this report carefully! Is your chapter listed? If not, won't you do all in your power to help it join this march toward a permanent home for *SCSA*.

Harold Rhodes, Route 3, Morgantown, West Virginia, is chairman of the *Society's* building fund efforts. Write him, let him know what you and your chapter are doing. And if you need help of any kind relative to the building fund just let him know.

The Bennett Memorial Fund is a part of the funds reported in the building fund report. On January 1, 1961, this fund contained $2,224.43.

Architects plans for the new *SCSA* headquarters building, dedicated to the memory of Hugh Hammond Bennett, will be sent to all *Society* members in February.

Plans now call for construction to begin July 1, 1961. This, however, is contingent upon having $35,000 on hand by April 1. During the next three months we'll need to double the fund. Have you made your pledge?

## Editorial Board

William C. Ackermann, Chief, Illinois State Water Survey, has been named to the Editorial Board of the JOURNAL by *SCSA* president Walter Gumbel. Ackermann is a native of Wisconsin, and received his degree in civil engineering from the University of Wisconsin in 1935. After graduation he was employed by the Kimberly-Clark Paper Corporation in Neenah, Wisconsin. From 1936 to 1954 he was in the Water Control Planning Department of the Tennesse Valley Authority where he was concerned with water control research and operations.

From 1954 to 1956 he was Head of the Watershed Hydrology Section of the Agricultural Research Service, U. S. Dept. of Agriculture. Since May of 1956 he has been Chief of the Water Survey in Illinois, and in this capacity is concerned with all phases of water resources.

Herbert C. Fletcher of the Agricultural Research Service, Beltsville, Maryland, is retiring from the Editorial Board.

Horace J. Harper and Ramon L. Kent have accepted three year continuations of their appointment to the Editorial Board.

# Progress Toward a Home for SCSA

▶ *It shall be builded not only of stone, mortar, and the woods of the forest, but of the spirit of its founders and the devotion and loyalty of Society members like you and me.*

▶ *It shall serve not only to sustain the character, the structure, and the archives of the Society, but it shall ever serve to advance the science and art of good land use in the interests of all humanity.*

▶ *It shall stand not only as a fitting tribute to years of service by many, but as an inspiration to those who follow in the paths of research, service, and leadership in conserving our renewable natural resources.*

## Building Fund Report — January 1, 1961

| Chapter | Chapter Pledge | Individual Unpaid Pledges | Paid to Date | Other Evidence of Support |
|---|---|---|---|---|
| No Affiliation | | $ 80 | $ 532.00 | |
| Washington, D. C. | $5,000 | 2,790 | 1,644.42 | (2) |
| South Dakota | | 35 | 1,185.25 | |
| Lincoln *(Nebr.)* | | | 131.00 | (1) |
| Salina *(Kans.)* | | | 64.00 | |
| Bozeman *(Mont.)* | | 20 | 49.50 | |
| Wisconsin | | 16 | 279.00 | (1) (2) |
| Wm. Penn *(Pa.-Del.)* | 400 | 40 | 330.50 | |
| South Carolina | | 84 | 319.55 | (1) |
| North Texas | | 8 | 124.50 | (1) |
| Rio Grande *(N. Mex.)* | 75 | | 123.50 | |
| Inland Empire *(Wash.-Idaho)* | | | 128.00 | |
| Empire State *(N. Y.)* | 2,000 | 24 | 479.50 | (2) |
| California | | 8 | 1,213.50 | (2) |
| West Virginia | 3,000 | 899 | 1,398.00 | (2) |
| Pocomoke *(Md.)* | | | 5.00 | (1) (2) |
| Keystone *(Pa.)* | 1,000 | 16 | 115.00 | |
| So. New England *(Conn.-Mass.-R. I.)* | | 24 | 58.00 | (1) |
| New Jersey | 1,250 | 28 | 912.50 | (2) |
| N. E. Oklahoma | | 8 | 159.32 | |
| El Paso County *(Colo.)* | 250 | | 10.00 | |
| Michigan | | 310 | 412.25 | (1) (2) |
| Northern Kentucky | | | 25.00 | |
| Hoosier *(Ind.)* | | | 367.00 | (1) (2) |
| Blue Grass *(Ky.)* | | 8 | 50.00 | (2) |
| Virginia | 2,500 | 60 | 778.50 | (2) |
| Kentucky Lake | 250 | | 71.50 | (2) |
| Florida | | 268 | 302.00 | (1) |
| Mississippi | | 56 | 32.00 | |
| R. N. Irving *(Idaho)* | | 40 | 50.00 | |
| Arizona | | 16 | 67.00 | |
| Georgia | 5,000 | 28 | 260.00 | (2) |
| North Carolina | 5,000 | | 435.50 | (1) |
| Green River *(Ky.)* | | | 25.00 | |
| Iowa | 5,000 | | 1,307.75 | (2) |
| Manhattan *(Kans.)* | | 90 | 232.00 | (2) |
| Ontario *(Canada)* | | | 98.00 | |
| Central Oklahoma | | 8 | 22.00 | |
| Minnesota | | 113 | 262.25 | (2) |
| Lake Cumberland *(Ky.)* | | | 5.00 | |
| S. C. Oklahoma | 100 | | 58.00 | |
| S. C. Nebraska | | 8 | 131.00 | |
| N. New England *(Maine-N. H.-Vt.)* | 1,480 | | 55.00 | (1) (2) |
| Ozark Mt. *(Ark.)* | | | 25.00 | |
| Egyptian *(Ill.)* | 250 | | 55.50 | (2) |
| Border *(N. Dak.)* | | | 15.00 | |
| Pony Express *(Kans.)* | | | 123.39 | (1) |
| East Texas | 250 | 73 | 134.50 | (2) |
| Northern Illinois | 2,600 | 484 | 457.20 | (2) |
| Custer *(N. Dak.)* | | 4 | 62.50 | |
| Upper Kentucky River *(Ky.)* | | | 40.00 | (1) |
| North Alabama | | 20 | 21.00 | |
| South Alabama | | | 154.50 | (1) |
| Show-Me *(Mo.)* | | | 208.00 | |
| West Tennessee | 570 | 8 | 134.00 | (2) |
| Old Line *(Md.)* | 1,500 | | 386.00 | (2) |
| All Ohio | 1,000 | | 197.00 | (1) (2) |
| East Tennessee | 900 | 8 | 56.00 | (1) (2) |
| High Plains *(Kans.)* | | 8 | 42.02 | |
| E. C. Oklahoma | | | 92.00 | |
| Big Hunt *(Okla.)* | | | 13.00 | |
| Stillwater *(Okla.)* | | | 55.50 | (2) |
| R. N. Irving *(Idaho)* | | | 132.00 | (2) |
| Southwest Oklahoma | | 8 | 97.00 | |
| Bob White *(Kans.)* | | | 20.00 | |
| Bluestem Hills *(Kans.)* | | 24 | 31.00 | |
| Wyoming | | 24 | 64.00 | |
| Southeast Oklahoma | | | 13.50 | |
| Olympic View *(Wash.)* | | | 14.00 | |
| Oregon | | 160 | 100.00 | (1) |
| Andrew Jackson *(Tenn.)* | 1,000 | 66 | 265.50 | (2) |
| Ft. Hays *(Kans.)* | | | 20.00 | |
| Northwest Oklahoma | | | 2.00 | |
| Louisiana | | | 100.00 | |
| Puerto Rico | | | 50.00 | |
| Ark. River Bend *(Kans.)* | 320 | | 19.00 | (1) (2) |
| Korea | | | 20.00 | (1) |
| Central Arkansas | 800 | | 2.50 | |
| Southwest Nebraska | | | 14.00 | |
| Northeast Nebraska | | | 29.00 | |
| Heart of Texas | | 10 | 563.01 | |
| Total | $41,495 | $5,982 | $18,137.41 | 39 |
| Interest earned | | | $ 204.06 | |
| Total on deposit | | | $18,341.47 | |

(1) General Chapter Support
(2) Chapter Building Fund Committee Organized

# News Notes

## WATER POLLUTION CONFERENCE

Approximately 1200 individuals attended the National Conference on Water Pollution held in Washington, D. C., December 12-14.

On the first day, which was a plenary session, addresses were given by Dr. Leroy Burney, Hon. Arthur S. Flemming, Mr. Albert Forster, Dr. Ira Gabrielson, and Mr. Mark Hollis.

*SCSA* member, C. R. Gutermuth, vice-president of the Wildlife Management Institute, delivered the address "Pollution is a People Problem" for Dr. Gabrielson who was unable to attend because of an exceedingly heavy snowfall just prior to the Conference.

The second day found conferees attending four panel discussion sessions running simultaneously. Although no formal votes were taken, the four panel discussions developed 31 recommendations for the Department of Health, Education and Welfare to consider in developing a summary of the Conference.

## AMERICAN SOCIETY OF AGRONOMY

More than 1,500 soils and crop scientists gathered in Chicago, December 5-8 for the annual meeting of the American Society of Agronomy. Meeting concurrently with the ASA was the Crop Science Society of America and the Soil Science Society of America.

Dr. B. R. Bertramson, chairman of the agronomy department at Washington State University, was named as the new president of the American Society of Agronomy. J. R. Cowan of Oregon State College was elected president of the Crop Science Society and Werner L. Nelson, midwest manager of the American Potash Institute, was elected as president of the Soil Science Society. Bertramson and Nelson are *SCSA* members.

## WATERSHED CONGRESS

"Count Down on Water" will be the theme of the 8th National Watershed Congress to be held at the Ramada Inn, Tucson, Arizona, April 17-19.

The National Watershed Congress is dedicated to improved natural resource management and use on a watershed basis. *SCSA* is one of the sponsoring organizations of the Congress.

"Planning for Water Use," "Multiple Use of Watersheds," and "Water for a Thirsty Land" are the main topics for consideration on each of the 3 days the Congress will be in session. Informative and interesting tours have also been planned as a part of the meeting.

## REVIEW COMMISSION MEETS

Chairmanned by Laurance S. Rockefeller, the Outdoor Recreational Resources Review Commission held its third joint meeting with its advisory committee at Jackson, Wyoming, July 29-August 1.

Rockefeller indicated that as a result of this meeting a "positive and forward-looking legislative program" dealing with the Nation's future outdoor recreation opportunities will be submitted to the President and Congress.

Eight members of Congress are commission members. The meeting was divided into four discussion groups: (1) Recreational Objectives of National Parks and Forests, Senator Clinton P. Anderson (New Mexico), chairman; (2) Wilderness as a Recreation Resource, Congressman John P. Saylor (Pennsylvania), chairman; (3) Administration of Recreation in National Parks and Forests, Congresswoman Gracie Pfost (Idaho), chairwoman; and (4) Recreation and Federal Water Development, Congressman Al Ullman (Oregon), chairman.

The four groups each made field investigations of various Federal land areas during two days of the four day meeting.

*SCSA* members on the 25 man citizens advisory committee to the commission include Mr. and Mrs. Lloyd Partain and Mr. Mrs. DeWitt Nelson.

## PERKINS ELECTED

The president of the University of Delaware, Dr. John A. Perkins, has been elected as president of the Association of Land-Grant Colleges and State Universities for the coming year.

## DATES TO REMEMBER

**National Association of Soil Conservation Districts Convention.** February 5-9. Memphis, Tennessee.

**American Society of Range Management Convention.** January 31-February 3. Sale Lake City, Utah.

**National Water Symposium.** March 28-30. Washington, D. C.

**American Society of Agricultural Engineers.** June 25-28. Ames, Iowa.

**National Farm Safety Week.** July 23-30. Sponsored by the National Safety Council.

For further information concerning any of these meetings please contact *Society* headquarters at 838 Fifth Avenue, Des Moines 14, Iowa.

## WORLD FORESTRY CONGRESS

Dr. Richard McArdle, as president of the Fifth World Forestry Congress, presented to the University of Washington the International Friendship Grove planted during the recent Congress.

On September 3, professional foresters from 64 countries each planted a tree, native or symbolic to his country.

This Congress, which met August 29-September 10, with the theme "Multiple Use of Forests Lands," attracted participants from 71 foreign countries. It was the first for which the United States has been host, the last Congress having been held in 1954 at Dehra Dun, India. Proceedings of the Congress will soon be published.

## CONSERVATION STAMP

The Post Office Department will issue the world's first range conservation commemorative postage stamp February 2, 1961, at the annual meeting of the American Society of Range Management in Salt Lake City, Utah. It will go on sale at all other U. S. Post Offices on February 3.

This stamp is the eighth in the Conservation Series that has included four wildlife stamps, and, during the last 3 years, stamps featuring forestry, soil conservation, and water conservation.

## CHAPTER NEWS

**Kansas** State Council of Chapters is working toward issuing a joint proclamation for observing Soil and Water Conservation Week and Soil Stewardship Week at the same time.

Plans are also underway for selecting an outstanding Kansas *SCSA* member and a superior chapter.

**Egyptian Chapter** (Illinois) members heard an interesting report on the rural development program in southern Illinois at a meeting on December 9. Les Broom of the Extension Service and Jim Gillooly of SCS cooperated in presenting and discussing the program's implications and results as measured in Alexander and Pulaski counties.

Lee Gard, chairman of the chapter's Research Needs Committee, indicated that the committee hoped problems met by local people would be presented to his committee for consideration.

**South Dakota Chapter.** "Population Change—A Challenge to the Economy and to Conservation" is the theme of the chapter's annual meeting to be held at Brookings, February 6-8. A most comprehensive and vital program has been planned under the direction of Joseph Paulson, Annual Program Committee chairman.

**Inland Empire Chapter** (Washington and Idaho). Moscow, Idaho attracted chapter members on December 28 and 29 as the chapter's annual meeting was held in connection with the Northwest Science Association's meeting.

Sixty-two boys attended the 1960 Natural Resources Youth Camp jointly sponsored by the chapter, the Pacific Northwest Section of the American Society of Range Management and the Inland Empire Section of the Society of American Foresters.

**Louisiana Chapter** has planned their second annual meeting for February 15 and 16. They will convene in Baton Rouge for a superior program planned by Alton Mangum and his Program Committee. This meeting should provide much worthwhile information for chapter members and guests.

**Western Puerto Rico Chapter.** On December 9 the enthusiastic efforts of the **Puerto Rico Chapter** culminated in the presentation of a charter by the *Society's* executive secretary to the newly formed Western Puerto Rico group.

Frank Gaudier was named as chapter chairman while Luis Rivera was elected to the post of secretary and Roberto Chevres to the office of chapter treasurer.

**Iowa Chapter.** Approximately 85 persons attended the 1 day chapter meeting in Ames on October 14, to consider the theme "Soil Conservation as Related to Population Increase." A most scholarly presentation was made by Prof. John Timmons on the subject, "Can the World Feed Its Growing Population?" In this talk he pointed out that resources should and must be the dependent variable while man is the independent variable in an equation relating man to the world's resources.

John Pesek, James Sarcone and George Croft also occupied important places in the program. Ralph Olson, an Iowa farmer who spent 3 months in India last winter, exhibited a beautiful set of colored slides.

A formal presentation of national *Society* awards was made to those individuals who could not be present at Guelph. Earlier in the month formal presentation of the Fellow Degree certificate was made to Clyde Spry at a meeting in Davenport.

During the business meeting Walter Weiss was elected chapter president; Lyle Mitchell, vice-president; Ed Crocker, secretary; and Fred Morgan, treasurer.

It was reported that 337 members of *SCSA* belong to the Iowa Chapter and that 18 percent of the total individual sustaining members of *SCSA* are Iowans.

**Keystone Chapter** (Pennsylvania) held its 14th annual meeting at Bedford, July 29-30. The meeting centered on opportunities for recreation in Pennsylvania and in the national parks. A highlight of the meeting was the chapter banquet held in the ballroom of the Fort Bedford Inn.

**South Carolina Chapter** chairman, Hugh Dowdle, presented medals to the members of the winning State 4-H soil judging team on August 17. Paul H. Russell, a new SCSA member in South Carolina, attended the annual meeting in Guelph

**Minnesota Chapter.** An outstanding symposium on rural zoning was the feature attraction of the annual chapter meeting held in St. Paul on January 11. Progress in the application of the new Minnesota zoning law, soil resource area studies with regard to land use, rural zoning in Wisconsin, zoning for flood control and zoning for recreational needs were among some of the important topics discussed.

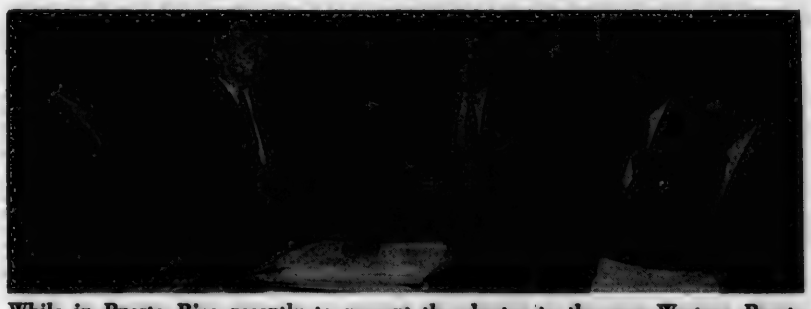
**Wisconsin Chapter** will hold their annual meeting January 13 at the Milwaukee Memorial Center. They are shooting for an attendance of 150 persons.

At Boscobel, on September 30 the chapter held a profitable meeting and discussion of reforestation problems in Wisconsin. At that meeting the chapter Land Use Committee indicated it would have the Principles of Land Use Report ready for presentation at the annual chapter meeting.

**Northern Illinois Chapter** held their seventh annual meeting at Lincoln on October 27. After a full morning's business session at which Ray Lane was elected chapter chairman for the coming year, the afternoon was devoted to consideration of Illinois water resources and conservation on efficiently managed farms. An evening banquet climaxed the day.

**Michigan Chapter.** In addition to the usual top-notch program planned for the annual meeting on February 2, the chapter will have a professional improvement session during the afternoon. This will be a panel presentation covering careers, recruitment, training, advancement, etc., in many of the professions in the area of resource management and use.

**Georgia Chapter** recently ordered 100 of the Hugh Hammond Bennett coins mentioned in the November JOURNAL. Also ordered were 30 coins imbedded in a plastic case.



**While in Puerto Rico recently to present the charter to the new Western Puerto Rico Chapter, SCSA Executive Secretary, H. Wayne Pritchard, met with several Commonwealth officials to discuss soil and water conservation problems and matters related to cooperation which Puerto Rico may offer in helping to establish the Society in Latin America. (Left to Right) Dr. Joaquin F. Marrero of the Soil Conservation Service; H. Wayne Pritchard; Enrique R. Ortiz, Under-Secretary of Agriculture; Salvador Vazquez-Garcia, Chief, Bureau of Conservation of Agricultural Resources; and Temistocles Diaz, Chief, Pasture Management Program.**

**Group of Rowan County Boy Scouts with Ed Brewer, SCS soil scientist, discussing soils and soil classification in preparation for merit badge tests in soil and water conservation.**

**North Carolina Chapter** reports that Boy Scouts throughout the State are again being offered the assistance of members of the *Society* in earning Merit Badges in Soil and Water Conservation, Forestry, and Wildlife Management. The project proved so popular last year—3,600 Scouts in 315 troops involved—that the chapter plans to establish the program permanently.

The recent excellent chapter newsletter indicates that W. O. Lambeth will serve as chapter prexy in 1961, while vice-president (east) will be Q. W. Patterson, and vice-president (west) will be J. N. Craver. Mrs. Florence Mitchell was elected as secretary and K. E. Graetz was named treasurer.

**Hoosier Chapter** (Indiana). Dr. Cecil Wadleigh, director of the Soil and Water Conservation Research Division of ARS was the featured speaker at a banquet concluding the chapter's annual meeting on January 6. The meeting featured a study of small watershed problems in Indiana as well as a regular chapter business session. An attendance exceeding 240 was recorded.

**Oregon Chapter.** A tour of the college seed research laboratory at Corvallis was a part of the annual meeting program held on December 16. Forage crop establishment and utilization was the central axis about which six separate presentations revolved.

**Limestone Chapter (Kentucky) on tour after a recent chapter business meeting held in Russellville. The group visited several of the 26 floodwater retarding structures in the 240,043 acre Mud River Watershed. The Kentucky Department of Fish and Wildlife Resources is cooperating through Public Law 566 in this multi-purpose program.**

## DEATHS

**Harry Beeson,** conservationist for Decatur, Illinois. Died of a heart attack while hunting with his son on Saturday, October 22, 1960. He was currently serving as secretary of the Northern Illinois Chapter.

**John R. Henry,** staff specialist, Division of Watershed, Wildlife, and Range Management, U. S. Forest Service, Atlanta, Georgia. Died of a heart attack while attending a movie on Labor Day.

**Edgar E. Luecke,** 407 McIndoe, Owatonna, Minnesota.

**Harry Rigdon,** 1715 West Arrowhead, Stillwater, Oklahoma.

**Dean A. Hoblit,** McLean Illinois.

**James E. Burns, Sr.,** Route 1, Hammond, Louisiana.

**Wayne W. Cornette,** Route 1, Pikesville, Kentucky, 1959.

**Jesse M. Pollitt, Jr.,** Allen, Maryland, July 14, 1960.

**Arvy Carnes,** Auburn, Alabama. A heart attack at home caused death December 17, 1959.

**Robert Dando,** SCS, Marquette, Michigan.

**Marcella Juhren,** Altadena, California.

**John D. McConnell, Jr.,** photographer for SCS, Fort Worth, Texas.

**R. P. Badger,** Durant, Oklahoma, passed away in November 1959.

**Macy H. Lapham,** Piedmont, California. Past president San Francisco Bay Chapter SCSA and well known soil surveyor. Died in February.

**W. A. Sumner,** Madison, Wisconsin. Passed away in January. He was a professor at the University of Wisconsin.

**W. E. Humphrey,** Pauls Valley, Oklahoma.

**Charles J. Johnson,** Lancaster, California. Killed in auto accident, January 14, 1960.

**Ben F. Blackburn,** work unit conservationist, SCS, Moundsville, West Virginia, December 29, 1959.

**E. E. Smith,** area conservationist, SCS, Chariton, Iowa, May, 1960.

**Ernest F. Carmichael,** Spartansburg, South Carolina, spring 1960.

**Junius I. Crossett, Jr.,** Moscow, Tennessee. President of the Moscow Savings Bank and longtime agricultural leader, Mr. Crossett died suddenly of a heart attack while attending the American Society of Agricultural Engineers convention in Memphis.

**Paul Albosta,** Burt, Michigan. Passed away July 10, 1960.

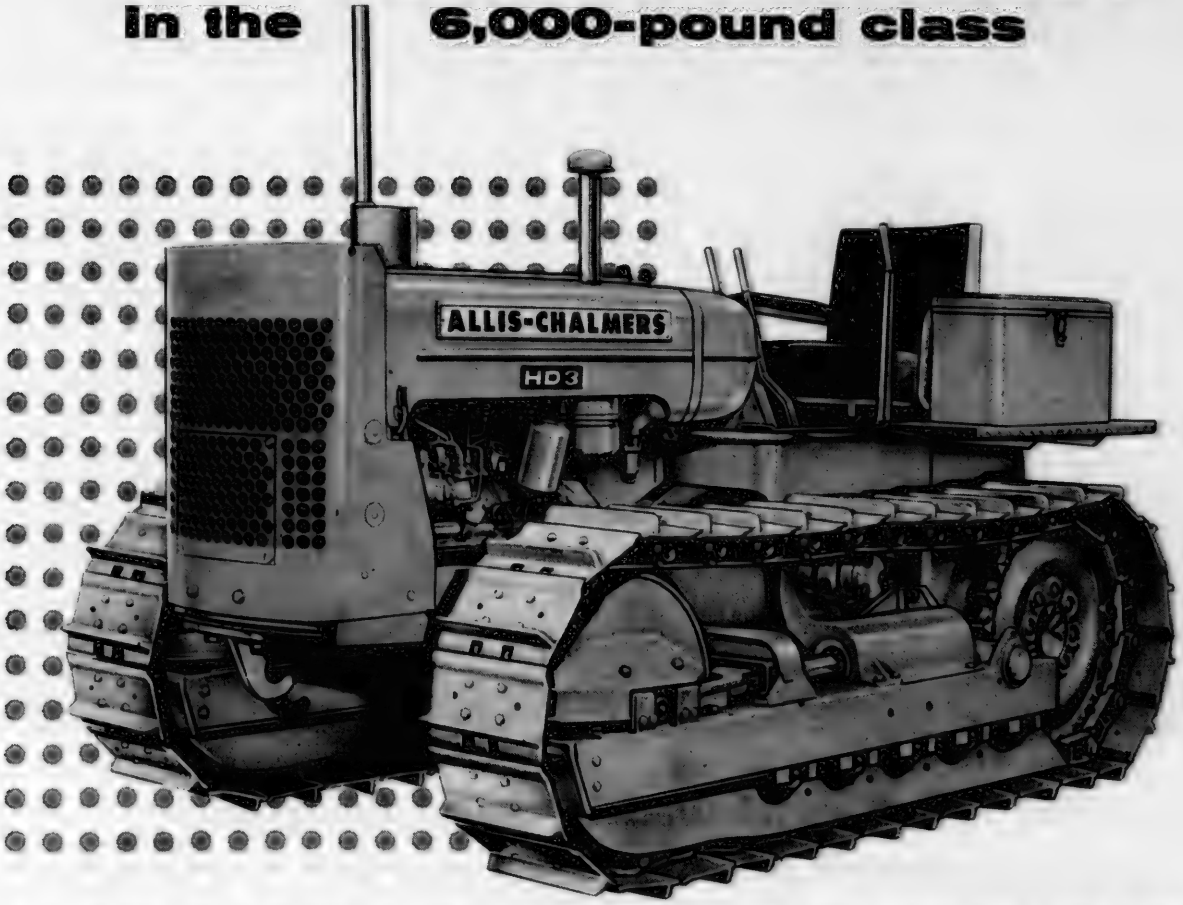
**Bernard Rozendal,** Huron, South Dakota. Died February 12, 1960.

# new

H-3 GASOLINE POWERED

HD-3 DIESEL-POWERED

## TOUGHEST COMPACT CRAWLER in the 6,000-pound class




Allis-Chalmers now gives you the toughest compact crawler tractor in the 6,000-pound class—backed by more than 30 years of experience in crawler tractor manufacturing!

Your choice of fuel—gasoline or diesel. The H-3 has the famous 4-cylinder, 43-hp POWER-CRATER engine. The HD-3 diesel is the 4-cylinder, 40-hp engine with follow-through combustion.

Solid, box-type, all-steel main frame securely cradles engine and power train—assures alignment of tractor components and mounted equipment.

Rugged track assembly proved through the years on other Allis-Chalmers crawlers. Heat-treated shoes; long, solid truck frame; large cast steel drive sprockets; heavy-duty forged truck wheels with full 2-inch-diameter shaft carry weight evenly (shown with 5 truck wheels, four are standard).

Independent steering clutches and brakes assure positive maneuvering and minimum maintenance.

Choice of big-capacity "live" hydraulic systems provides instant control of equipment whether mounted on the front, rear, or combination of front and rear of the tractor.

**SHUTTLE clutch**—standard equipment—gives fast, smooth direction reversing—speeds equal in forward and reverse in any given gear.

See the full line of matched companion equipment for the new *compact* H-3 and HD-3! Talk to your Allis-Chalmers dealer today, or write Allis-Chalmers Mfg. Co., Utility Crawlers, Milwaukee 1, Wisconsin!

POWER-CRATER is an Allis-Chalmers trademark.

# ALLIS-CHALMERS

# "Selling" soil and water conservation pays handsome rewards for contractor

**Guy H. Briscoe, Lubbock, Texas, conservation contractor, "sells" conservation, develops new customers—and then reaps the rewards with his Cat Diesel Tractors! *Perhaps his success story can help you do the same.***

Briscoe operates in the Great Plains Conservation Plan area. He has made a special point to get well acquainted with the Plan, so he can use it as a sales tool by explaining it to his customers.

For example, outlining the Great Plains Conservation Program to ranchers G. W. and James Cochran near Blackwell, Texas, helped Briscoe win a substantial contract, with GPCP cost-sharing to be on a 50% basis for brush control, 80% on seed and 50% on pond construction.

First work started in 1959 and completion is scheduled for 1962. By that date, approved practices will have been applied to 4,450 acres of rangeland and 586 acres of cropland. This will include root plowing for brush control on 2,200 acres, and clearing 600 acres of Red Juniper using a tractor equipped with cutter bars attached to the bulldozer blade (see photograph at upper right).

The entire range is seeded at the time of

brush control with a mixture of sideoats grama and blue grama with blue panic to be added later by the ranch owner.

All stock ponds are conical pit type which require moving approximately 10,000 cu. yd. of dirt. A total of six will be built with cost sharing funds; the owner plans to build more, and enlarge several others at his own expense.

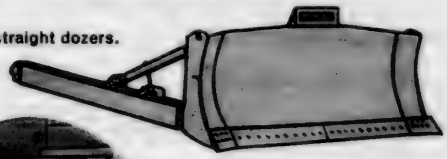
This is one good example of how a thorough knowledge of conservation funds available—self promotion—and the right equipment have helped Guy Briscoe find steady work and good pay for his men and equipment. His wise planning has paid off: today, he keeps his five-tractor spread busy the year 'round, clearing, leveling, root plowing and deep tilling. His equipment includes a D8 with a Root Plow built by Holt Equipment Co., two other D8s with Giant Plows (50" discs) built by Towner Company, and two Cat D6 Tractors, one equipped with a cedar grubbing attachment, and the other with a seeding attachment.

It's no secret that "know-how" backed by good equipment helped Briscoe succeed. The same formula applied to your work can help you, too. A good place to start is with your Caterpillar Dealer. He knows the local conservation program and can help you in many ways. Equally important, he handles the most efficient equipment for land development, land clearing and earthmoving . . . built by Caterpillar. This team backs your job, to help you succeed! Put this team to work for you, today!

Pictured here are 3 important members of Briscoe's conservation team: (1) His Cat D6 Tractor and bulldozer, a versatile, compact outfit that stands up to the hard work of conservation, (2) a "Stinger" mounted on the blade to rip out individual cedars, and (3) a seeding attachment. This complete unit may have a very good application in your area, too. Ask your dealer about it.

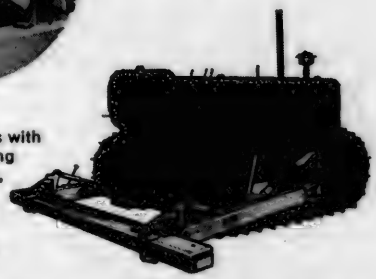
## OTHER EQUIPMENT AVAILABLE FOR CONSERVATION WORK

Angle or straight dozers.



Hydraulic tilt cylinder allows fast, in-seat controls for tilting blade right or left.

Cat-built Tool Bars with many tools including subsoilers, chisels, furrowers as well as root plows and rakes built by Fleco Corporation.



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**SOIL CONVERSATION**

*"Farming Up And Down The Hills Makes Pay Dirt 'Dirt Cheap' Fast"*

## NEWS OF MEMBERS

**Hub Alloway** of the Agricultural Research Service is the new head of the Plant, Soil and Nutrition Laboratory at Cornell University, Ithaca, N. Y.

**Frank Mendell,** state conservationist in Iowa, received a beautiful gold wrist watch last month from the Iowa Farm Safety Council in recognition of his outstanding leadership in farm safety. He has been president of the Council for the past 2 years.

**Theodore W. Pawlowski** has been named area conservationist for the Soil Conservation Service and will headquarter in Spencer, Iowa. He was formerly work unit conservationist at Wallingford, Connecticut.

**Clarence M. Ferguson** has accepted an assignment as professor in the National Agricultural Extension Center for Advanced Study at the University of Wisconsin. The Center offers graduate training in extensive administration and supervision and was established in 1955 with the aid of the Kellogg Foundation. Ferguson was Administrator of the Extension Service from 1953 until late in 1960 when he was named Assistant Secretary of Agriculture.

**N. R. Richards,** *SCSA* Council member representing the Canadian region, is working closely with the "Resources for Tomorrow" conference to be held October 23-28, 1961, in Montreal. He will represent the *Society* at this all-Canada meeting.

**Conny C. Ricker** retired November 1 as area engineer for the Soil Conservation Service at Greencastle, Indiana. Ricker began his work as an engineer with SCS in 1935 and worked continuously to help develop the best designs for engineering structures and mechanical practices adapted to the solution of soil and water conservation problems.

**Oscar C. Bruce** of Missouri, **Charles B. Anders** of Mississippi, and **L. L. Lough** of West Virginia, all veterans of more than a quarter-century of service in the Soil Conservation Service, and all state conservationists in their respective states, will soon be retiring.

**Howard C. Jackson,** assistant state conservationist in Missouri since 1943, will become state conservationist there upon the retirement of Mr. Bruce.

**William L. Heard,** assistant state conservationist in Mississippi since 1946, will become state conservationist there when Mr. Anders retires.

**Ira K. Landon,** technical advisor for the International Cooperation Administration in the Republic of China since 1954, has devised an ox-drawn scraper which Taiwan hill farmers are now using to build terraces. With the aid of this scraper, constructed by local blacksmiths, one man and a buffalo can do as much work as four men with baskets.

When Landon first arrived in Taiwan, he realized that stabilizing the slopes was the only answer to the Chinese farmer's erosion problems. Securing a tractor with a bulldozer, Landon demonstrated how a series of bench terraces could be built quickly and easily where a gully was eating its way up a slope. But the demonstration was not a success for the farmers could not afford to buy or rent the big machinery.

Later, while home on leave in the United States, Landon was driving through New Mexico and saw an abandoned Fresno scraper in the desert. He photographed and measured it and as soon as he returned to Taipei, had one constructed by a Chinese blacksmith.

At last count 200 scrapers to be pulled by a buffalo had been built, and terrace construction is proceeding at a lively rate.

# Newest in features—with 40 million hours' experience!

*See all the ways that years-ahead . . . farmer-proved IH design makes new Farmall® and International® tractors your best power buys!*

No other tractors are as "new" in features as today's Farmalls and Internationals. And no other "new" tractors come close to matching the forty million hours of proved performance of today's IH tractors.

Millions of hours of field work have proved that *exclusive* IH Multi-Range power really saves money. Additional millions of work hours have further proved that "farm-easy" features like Torque Amplifier, Hydra-Touch hydraulic control . . . Fast-Hitch and many others are sensible savers of time and labor—not untried ideas.

Compare a Farmall or International with any other "new" tractor. The more you compare, the more reasons you'll find to go IH with power that's years ahead and proved by 40 million hours' experience.

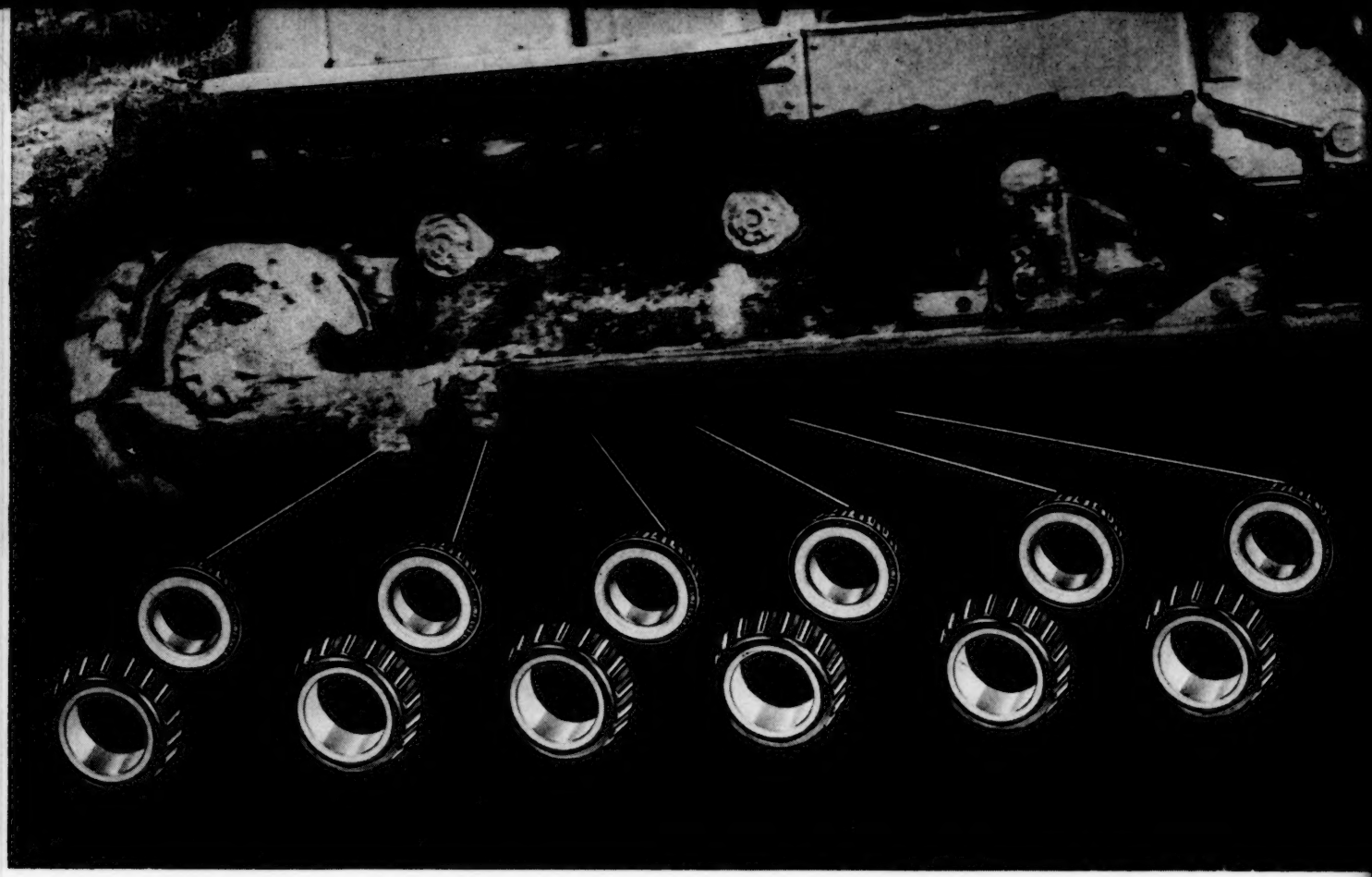
Save on the IH Early Trader's Bonus Plan. Get cash for dealing *now* on a proved Farmall or International tractor. IH pays interest at the rate of 6% on your trade-in and/or down payment from the time the deal is closed. See your International Harvester dealer, now!

**INTERNATIONAL HARVESTER**

**Exclusive Multi-Range Engines** deliver the big power you need to master tough jobs with new ease and economy. Only IH Multi-Range tractors give both top big power and small tractor economy on light loads.

**"Loaf" on Light Jobs.** With Multi-Range power, shift up to a high gear, reduce engine speed for the right pace to match the job. Big-power engines "loaf" along, give you small tractor economy.

**Wade through tough spots non-stop** with fully proved Torque Amplifier. There's no stopping, no over-speeding the engine. An easy pull on the TA lever triggers a pull-power boost of up to 45% on-the-go.



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**Reduced friction through use of tapered roller bearings in all Allis-Chalmers crawler tractors makes the difference in work power and profit for you!**

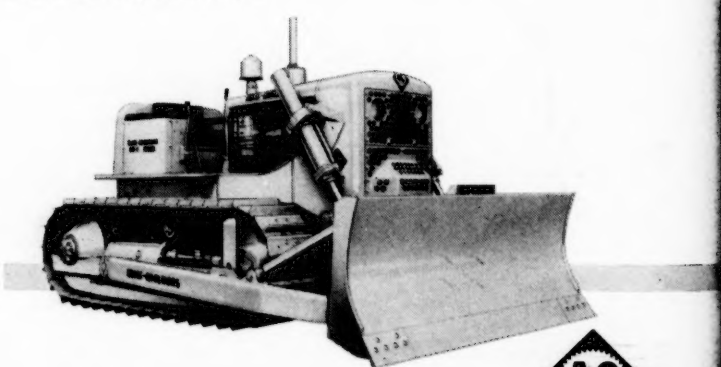
All Allis-Chalmers crawler tractors roll on tapered roller bearing truck wheels. Most others still use bushings.

Anyone who remembers his roller skating days knows the performance advantages of bearings over bushings. The difference between first and also-ran was in the wheel bearing. This friction-reducing advantage is the reason railroads all over the country have turned to *roller* freight.

The same principle applies to tractors except much more power is being wasted by friction-type plain bushings. It's one of the reasons the 99-hp HD-11, on tapered roller bearings, produces right alongside larger crawler tractors. Can you continue to pay for power that *never* produces—that gets "lost" in old-fashioned bushings?

Your Allis-Chalmers dealer will be glad to discuss this and the many other advantages that keep the HD-11 on the go shift after shift with a minimum of maintenance.

Ask about the *toughest track ever built* . . . the *industry's healthiest engine* and *certified permanent lubrication.* Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.



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